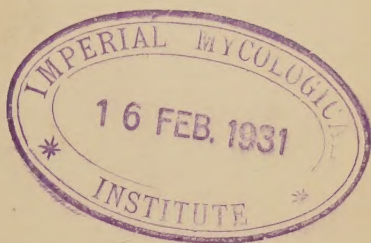


19/11

Zanzibar Protectorate.



Annual Report

OF THE

Agricultural Department

FOR THE YEAR

1929

AND THE

Agricultural Season ending June, 1930.

ZANZIBAR:

PRINTED AND PUBLISHED BY THE GOVERNMENT PRINTER.

1930.

Zanzibar Protectorate.

REPORT ON THE AGRICULTURAL DEPARTMENT

FOR THE YEAR 1929,

and the

Agricultural Season, July 1929—June 1930.

Section I.

STAFF.

The following table shows the strength and distribution of the European Staff during the year under review:—

Rank.	Name.	Period in Residence.
Director & Government Chemist	V. H. Kirkham, F.I.C., B.Sc. (London), Dip. Agric. (Cantab)	Whole year
Assistant Director	A. C. Barnes, F.I.C., B.Sc. (Vict.), A.M.I.Ch.E.	To March 1st
Assistant Government Chemist	L. W. Raymond, B.A., B.Sc. (London), A.I.C., A.R.C.S.	Whole year
Manager of Plantations	Graham Tomson	January 1st to 5th March. July 28rd to December
Agricultural Officers	Harold Waterland, Dip. Agric. (Harper Adams)	To August 16th
	J. E. Baker, Cert. Agric. (Seale-Hayne)	Whole year
	J. R. P. Soper, B.A. (Cantab.)	May 21st to December
	T. D. Rutter, B.Sc., Agric. (London), A.I.C.T.A. (Trinidad)	Whole year

Mr. A. C. Barnes was appointed Superintendent of Agriculture, Fiji, and transferred to that Colony in July, 1929.

Mr. Waterland was appointed Acting Assistant Director of Agriculture from March 2nd to 11th July, 1929, and Assistant Director of Agriculture July 12th, 1929.

Mr. Raymond was appointed Acting Assistant Director of Agriculture from 17th August, 1929, to end of the year.

EUROPEAN STAFF IN PEMBA DURING 1929.

Mr. H. Waterland, January to May 20th.

Mr. J. E. Baker, May to December.

Mr. J. R. P. Soper, May 27th to December.

The strength of the staff in residence during the year was 75 per cent of the maximum and is normal for the leave and passage conditions obtaining in the service.

Section II.

THE CLOVE INDUSTRY.

A. PRODUCTION.

As stated in my last Annual Report, it is impossible to deal with the industry of paramount importance to Zanzibar—clove growing—in a report confined to events falling within the calendar year. That report, written in October last, carried the review of the industry up to end of June, 1929, and indeed it was possible to remark upon the commencement of the 1929-1930 harvest.

In this report we are, therefore, concerned with the season commencing in July 1929 and terminating—for statistical purposes—at the end of June, 1930.

The previous season—1928-29—having been an unusually poor one, cloves brought to Town during July to June having amounted to only a trifle over two lakhs of fraslās (say 3,100 tons), it was only to be expected that the 1929-30 season would be unusually good. Expectations were realised and the season established a record.

Exactitude in statements of the measure of crops is an impossibility. Even when all cloves produced in the country had to pass through the Customs on entering Town for the purpose of excise it was not necessarily the case that all the cloves picked between July and February, the normal limits of the harvesting period, were brought to market between July and the end of June, nor that all the cloves brought in during that period belonged to that particular harvest. I have known four-year-old cloves brought into Town from the plantations, though this is very unusual.

Estimates have to be made of stocks from previous years brought in and hold-overs carried by the producers. Although old stocks coming in can be distinguished from new season's produce it frequently happens that, being drier, they are mixed with the new to enable the bulk to pass the standard required by the Produce Export Decree. As an estimate of the season's crop is fundamentally based upon the deliveries at the Customs, and such was not obligatory

during the past two seasons, excise having been taken at the time of export only, even the fundamental data have been lacking in the accuracy of former years. The clove deliveries we may characterise as the raw figures to distinguish them from those which the Comptroller of Customs prepares to represent so far as can be ascertained the quantity produced during the season.

In the season 1928-29 the deliveries were given as 2,00,568 fraslas, and during 1929-30 as 9,28,943. The latter raw figure requires various adjustments to allow for hold-over and parcels brought to Town but not passing through the Custom House for weighing, and the Comptroller of Customs is of opinion that the season's production must have reached at least 10 lakhs of fraslas (over 15,500 tons) and therefore have beaten the previous record of 9.8 lakhs in the season 1922-23. Early in 1930 it was realised that the succeeding crop would be an almost complete failure.

The tremendous variation in size of crop from season to season has not so far received an explanation. Precisely what effect it would have upon the market if future crops could be foretold it would be difficult to say. Speculation quickens interest, and the uncertainty of the future position must necessarily lead to competition in buying stocks. There is probably hardly another crop in which it is such a gamble to deal. Growers and merchants alike must speculate on the probability of the next crop and it is in vain that we look through the records of the past to give us a clue to the future.

An apparently safe system for the producer to adopt is to hold a proportion of his crop in years of great plenty; to hold very little when the crop is average and to sell that at the first sign of a large succeeding crop; to sell hold-over gradually and not except to get the top price of the year for the whole of it.

Before attempting to peep into the future it is well to consider this question of variation in size of crop critically.

When I visited Singapore in 1924, the Director of the Botanic Gardens there drew my attention to some clove trees which, though quite well developed, practically never produced a bud, whereas at Penang, about 380 miles away, clove production is an important industry which leads the world as regards quality. Mr. Birkill expressed the view that the difference in behaviour of the trees in the two islands was capable of a simple explanation, viz. that in Singapore the climate is uniformly moist whereas in Penang there are distinct dry periods, as in Zanzibar, and that this stimulus is necessary to cause the trees to flower.

Now were flowering a simple reaction to a climatic stimulus there would be no difficulty in correlating crops with meteorological

observations, but so far a correlation has not been found. The Dutch botanists who have studied the tree in its native habitat state that the clove only flowers twice in three years and will bear heavily once in from four to seven years. Periodicity in flowering is a general phenomenon, that is to say that flowering plants have a tendency to flower at certain periods apart from any external stimulus. The coconut palm flowers every 26 to 30 days, many plants flower twice a year, some annually, others only once in their existence. The clove tree appears to have an obscure periodicity so that the effect of the external stimulus—climate—is obscured. The same stimulus will only produce the same reaction if the tree is in the same phase. There is also a clear indication that when the external stimulus acts upon the trees when in a phase preparatory to flowering an abnormally large crop results, but a reaction follows, presumably due to temporary exhaustion, and the trees will completely miss flowering for a season. There is a kind of oscillation produced and the pendulum does not come to rest at once, large and small crops alternating for perhaps four seasons.

We have probably three factors to take into consideration.

- (1) The nature of the climatic stimulus.
- (2) The phase in the periodicity of the trees.
- (3) The reactions from a previous stimulation.

Obviously unless these factors are known and measured the resultant—the future crop—cannot be predicted.

During the first half of 1930 the trees certainly received a stimulus in the way of a dry period, and some of them will unfortunately never flower again. The dry period—May to August—was, however, not altogether seasonable, and it does not appear to have produced any tendency on the part of the trees to produce buds for the December—January portion of the crop. How many weeks or months pass before the effect of a stimulus is visible to the eye is not known, so that were we more certain even of its nature we should still be unable without further knowledge to gauge the effect upon a forthcoming crop whose size may be affected by the conditions obtaining only during a particular and short interval of time.

Our peep into the future—the season 1931-32—cannot therefore be made with anything approaching safety. We do not know how the past, present or future climatic conditions will modify the trees' inherent tendency. There has been a violent oscillation, two lakhs, ten lakhs, the present (1930-31) crop of less than two lakhs. The oscillation would tend to carry the future crop upwards, but it is obvious that we are too near the last phase of the heavy bearing period for it to appear again, and a rather above average, say $6\frac{1}{2}$ lakh, crop would appear to be the most probable event.

In my last Annual Report attention was drawn to what appeared to be the repetition of a previous cycle, and the following figures will be found of interest:—

Season.	Fraslas.	Season.	Fraslas.
1913/14	7,83,680	1924/25	7,61,412
1914/15	5,26,309	1925/26	6,11,814
1915/16	7,96,757	1926/27	7,33,029
1916/17	5,11,635	1927/28	6,90,752
1917/18	2,98,197	1928/29	2,00,568
1918/19	8,24,502	1929/30	10,00,000
1919/20	2,62,550	1930/31	1,75,000
1920/21	5,48,277	1931/32	6,50,000
1921/22	2,66,802	1932/33	?
1922/23	9,81,915	1933/34	?
1923/24	3,11,794	1934/35	?

The chief object in discussing the apparently fortuitous variations in the clove crop is to draw attention to the nature of the problem in the hope that observers in this and other countries will give some attention to the matter. It is possible that experience elsewhere with fruit or forest trees may put us in possession of the means to unravel the knot, and suggestions would be most gratefully received.

B. FINANCE.

It is inevitable that violent fluctuations in production should be accompanied by corresponding fluctuations in price. Some idea of these fluctuations will be gathered from the following figures of the average price of Zanzibar cloves for the month, with duty added.

Date.	Duty paid price Rs. per frasila.	
1929.	Rs. Cts.	
January	...	30 98
March	...	33 91
June	...	31 95
September	...	16 50
1930.		
January	...	14 74
March	...	18 65
June	...	19 81
September	...	22 21

There has during the past two or three years been a movement on foot in many parts of the world to stabilise production with the object of steadying prices. The general principle of making the supply fit the demand; of managing that the production is economically carried out; and of arranging that the consumer is supplied regularly at a price satisfactory to all parties, has been called "Rationalization".

To what extent this principle can be applied to the Clove Industry has been the subject of much thought by many minds. In the early part of the year under review a Committee was appointed to consider the matter generally. That Committee did not reach any agreement but the views which were expressed by members, in

many cases very divergent, were subsequently published with the object of stimulating thought upon the matter.

Possibly the word "Rationalization" is unfortunate. It cannot be translated into Arabic or Kiswahili in thought or word. The general impression gathered by the producers was that cloves should be "rationed" like food to soldiers, and the idea left them wondering. It was generally considered that we were dealing with a very difficult and abstruse matter, and the more the subject was discussed the further we appeared to get from understanding it. A speck of dust under the microscope becomes a boulder, and the smoothest pavement a land of impenetrable mountains.

Laying aside the rationalizer's microscope this simple issue appears:

Production of cloves cannot be stabilised. If the producers find it inconvenient to have a good income one year and practically none another they must not sell all their cloves at one time. If the consumers find it inconvenient to pay 1s. 6d. per lb. for cloves one season and 9d. per lb. another they must buy more freely when cloves are plentiful. One or the other must hold stocks. Whoever complains has the remedy in his own hands.

If producers and consumers were rational the question of rationalizing the industry would not arise. It would not seem unreasonable to put our own house in order before attempting to dictate to people overseas how much and when they should buy.

Comparing the two seasons 1928-29 and 1929-30, the former a two lakh crop and the latter in the region of a ten lakh crop, the average selling prices per frasla duty paid during the twelve months of each season were in the former Rs. 28-15 for Zanzibar and Rs. 27-98 for Pemba, and in the latter Rs. 18-29 for Zanzibar and Rs. 17-55 for Pemba. Considering the size of the 1929-30 crop the prices were very satisfactory and could not have been maintained had there not been a very distinct effort at internal "rationalization" in the shape of holding over stocks. It is estimated that something like 2½ lakhs of fraslas (3,900 tons)—more than twice the maximum production of Madagascar (our only serious competitor)—were held from the market. This indicates the strength of our position in the producing world.

During the twelve months ending June 1929, Zanzibar had exported 7.48 lakhs (11,700 tons) and Madagascar .54 lakh (850 tons) of cloves. Neglecting the smaller contributions from other countries (perhaps 400 tons) it is evident that at least 12,550 tons of cloves were bought during the period in which the Zanzibar price was about Rs. 18 per frasla duty paid.

Overseas stocks do not appear to have increased and there is every appearance of this quantity having been actually consumed.

The twelve months July 1930 to June 1931, will have available some

3,900 tons Zanzibar hold-over
3,000 tons Zanzibar new crop
1,500 tons Madagascar
<hr/>
8,400

This estimate shows that world supplies are 33 per cent less than the previous twelve months' consumption. At the moment of writing the duty paid price of Zanzibar cloves is about Rs. 24 per frasila. It would undoubtedly have been much higher had not the very important Indian market been dull owing to general trade disturbance.

C. INSPECTION OF CLOVES.

The Agricultural Produce (Export) Decree, 1929, came into force on August 17th. The object of this Decree is the same as that of the Agricultural Produce (Adulteration) Decree, 1927, which it revoked. The new legislation was necessary as experience had shown that the earlier decree was faulty, particularly in regard to fixation of responsibility as between Owners, Agents, Shippers, etc. Under the first decree it was an offence to deal in cloves which did not comply with the standards of quality laid down. Control could be exercised from the plantation to the wharf. The present decree limits control to the wharf, and therefore greatly reduces the amount of work involved in inspection. Refusal to permit exportation is the only punishment in the case of produce unfit for export being offered, but that this is a sufficient deterrent from attempts to ship such produce will appear from the following figures:—

August 17th, to December 31st, 1929.			
	Examined.	Passed.	Failed.
Consignments	... 1,139	1,115	24
Bales	... 91,955	89,320	2,635
January 1st, to June 30th, 1930.			
	Examined.	Passed.	Failed.
Consignments	... 857	848	9
Bales	... 60,624	60,127	497

Of the 1,52,579 bales of cloves, representing 1,996 consignments, examined between 17th August, 1929, and 30th June, 1930, 97.9 per cent passed, these representing 98.3 per cent of the consignments.

The rapidity with which merchants adapted themselves to the new conditions imposed upon them by the decree is remarkable, but it must be remembered that the previous Adulteration Decree had already effected a tremendous improvement in the quality of produce coming into the market.

The members of a Committee advising upon the nature of the new decree were divided in opinion as to the desirability of retaining powers of control before the actual time of export, some fearing that the producers would not respond to the law unless pressure were applied directly to them with the result that the onus of conditioning

cloves would fall upon the exporter and that he would necessarily give a very low price for produce obviously below or suspiciously near the standards prescribed. Particularly was this fear felt in regard to Pemba cloves as the producers were further away from the point of export and their produce would have changed hands many times before it was subject to examination.

How far these fears were justified will appear from the following figures supplied by the Comptroller of Customs:—

(a) Before the Export Decree came into force.

Period.	Zanzibar.		Pemba.		Difference.	
	Rs.	Cts.	Rs.	Cts.	Rs.	Cts.
1925-26	16	83	16	86	0	03
1926-27	13	77	13	71	0	06
1927-28	12	85	12	64	0	21
1928-29	28	15	27	98	0	17

(b) Decree published.

1929.

July	20	07	19	07	1	00
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(c) Decree in force.

August	16	00	13	02	2	98
September	13	20	12	20	1	00
October	14	51	13	57	0	94
November	12	96	12	16	0	80
December	12	26	11	64	0	62

1930.

January	11	44	10	90	0	54
February	12	20	11	82	0	38
March	15	42	15	35	0	07
April	18	61	18	53	0	08
May	17	66	17	38	0	28
June	16	71	16	54	0	17

(July 1929—June 1930, Excise Duty Rs. 3-30 to be added).

These figures do not represent the extreme fluctuations caused by the decree, but they enable a measure to be taken of the loss to Pemba through its failure to meet requirements. On the quantities changing hands the loss during the year must be in the neighbourhood of four lakhs of rupees.

The plantation owners undoubtedly prefer to lose money than to be subject to direct pressure and the above figures whilst indicating how severely they have punished themselves also show that after about six months they recovered their position.

From time to time the question of grading cloves has been raised. It is perhaps not fully understood in the overseas markets what is the precise nature of the Government control in Zanzibar. Formerly cloves were frequently shipped quite wet, due either to careless preparation, deliberate adulteration, or accidental damage

by rain or sea-water. Also large proportions of stems and other foreign matter were frequently present, again due either to careless preparation or deliberate adulteration. The inspection at present is directed exclusively towards preventing the exportation of cloves containing more than 16 per cent moisture or 5 per cent foreign matter. Although the decree provides for Rules being made for prescribing grades of quality such Rules have not been laid down. It must clearly be understood, therefore, that a certificate of quality under the decree only takes account of these two factors and does not purport to reflect upon the quality of the produce from any other point of view. Weather-beaten wind-fall cloves, the colour of ashes, swept up from the ground at the end of the harvest will, if they contain less than 16 per cent moisture and 5 per cent foreign matter, pass the test.

The Zanzibar Chamber of Commerce has recently given careful consideration to the advisability of prescribing a limit to the proportion of withered cloves (locally called *Khoker*) which shall be permissible in cloves. At first sight this appears to be a sound and simple proposition. If ordinary or normal cloves were of a regular and definite appearance the addition of *khoker* could be detected and its amount determined. Unfortunately the appearance of normal cloves varies very greatly depending upon the precise stage of ripeness when gathered from the tree and upon the climatic conditions and methods of handling obtaining during the drying period.

If there is wet weather during a heavy harvest the producer is unable to protect his cloves. Heaped in sheds they degenerate and if left spread out in the rain the colour is washed out of them. Under these circumstances a large proportion of the crop becomes wrinkled and discoloured and, in fact, indistinguishable from the *khoker* obtained from plantation sweepings.

When the bulk of a sample is bold and bright, with a proportion of dull, wrinkled and discoloured, cloves, it is obvious that the material has not been wholly prepared under the same conditions and is therefore a deliberate blending. The proportion of each quality present can easily be determined. When, however, the bulk is dull and discoloured it is impracticable to make any definite separation on an appearance basis.

The quality of a sample should be gauged by

1. Dryness.
2. Freedom from foreign matter.
3. Colour (reddish-brown, dark-brown, black, dull or bright).
4. Form (with or without crown, smooth or wrinkled, etc.)
5. Size (weight per 100 cloves).
6. Oil content

The present inspection guarantees a product satisfactory as regards 1 and 2. If grading were established 3, 4 and 5 would have to be taken into consideration and the grades determined in relation to these factors. Item 6, perhaps the most important one of all—it is the oil in the clove which alone gives it any value whatsoever—could not be undertaken as part of any general inspection, but the oil content of any sample can be obtained on payment of a fee.

In the grocery trade, including in that term the supply of cloves for all culinary and chewing purposes, colour, form and size, are important factors. The oil distiller can have no real interest in anything beyond the oil content though he may perhaps, mistakenly, regard the general appearance as a good guide to that point. The spice grinder is more interested in the oil content than in anything else as it is this which gives strength to the spice. Colour, however, may be some consideration to him.

Government is quite willing to undertake any grading which can be shown to be in the best interests of the industry and of this country. It is obvious that the consumers should indicate their requirements and to what extent they are prepared to pay a premium for the particular quality of produce which best meets their need. The producer would be prepared to offer fair-average-quality and premium cloves, the buyers would doubtless prefer F.A.Q. and discount cloves!

I have frequently observed very small differences in price between samples at the opposite ends of the scale. At the present moment with cloves at Rs. 24 per frasila duty paid, half a rupee is only 2 per cent of the price but represents buyers' opinion of the difference in value between the best cloves obtainable and some quite inferior produce.

Is grading therefore really required?

For the present at any rate the consumers must rely upon their agents or shippers to select for them the quality which they require. The best cloves are bought for the best price. If the consumer pays that price but gets "Khoker" he should change his agent. There are many firms in Zanzibar with long experience in shipping cloves to all the markets of the world and the Chamber of Commerce would always provide a list of such merchants on application.

D. ARTIFICIAL DRYING OF CLOVES.

Rumphius, the 17th century Dutch botanist, states that in his day cloves were covered with leaves and for some days subjected to a smoky fire. That was in Amboyna, the home of the clove. Nowhere in the world does fire-drying of cloves appear to be practised at the present day.

The question of artificial drying of cloves has been considered in this country from time to time, the first recorded experiments having been carried out by Mr. Lyne some twenty-seven years ago, though at a much earlier date hot-plates had been advocated but, so far as I know, not tried in practice. The 1903 experiments were more particularly tests on drying under glass, which process Mr. Withycombe is again exploring.

The Department of Agriculture experimented with fire-drying during the 1927-28 and 1928-29 seasons, reference to which was made in the previous annual report. During the 1929-30 season the crops on the Government Plantations were leased and there was no opportunity of carrying out field experiments on the subject; laboratory tests were, however, made to ascertain safe temperatures for drying so that loss of oil should not ensue. With the coming into force of the decree prohibiting the exportation of cloves containing more than 16 per cent moisture it was anticipated that some form of conditioning plant in the Town would become necessary.

The merchants were quite convinced that it would be impossible for them to bring the cloves into condition for export—they then proceeded to do it! For a month or two Zanzibar was transformed into a drying ground. Public and private open spaces, school playgrounds, roofs of houses, even roads and foot-paths, were covered with drying mats and cloves. The merchants certainly made the careless producers pay for the trouble involved, but their enterprise in carrying out the conditioning was admirable. During the period from the commencement of the decree, 17th August until 31st December, there was a normal amount of rain and a lot of wet cloves were brought into Town (as witness the variation in price before referred to), and yet of the 91,955 bales examined only 2,435 were rejected on the score of moisture. Of these 1,328 were removed from the Customs, dried and replaced, in time to catch the ships by which they were intended to be shipped. Only 1,107 bales (1.2 per cent) of all the cloves brought to the wharf during this period actually missed shipment on account of excessive moisture.

The producers have, since August 1929, learned something of their lesson and it now seems doubtful whether money spent on a mechanical drier would be a good investment.

The department invoked the aid of the Imperial Institute in ascertaining the probable outlay necessary to provide drying machinery for conditioning cloves. The proposals of a number of firms have been received but of their suitability for clove drying there is, of course, no experience.

It was intended to make further experiments to test the applicability of the different systems of drying to our produce, but

the clove harvest ended so abruptly that green cloves became unobtainable before much could be accomplished.

The conclusions arrived at were:

1. Hot air drying by natural draught is unsuitable. Quick drying is essential to obtain a good colour and air must be either at too high a temperature or else be under forced draught to remove the moisture at a satisfactory rate.
2. Drying on mats over a sand-bath type of kiln such as is used on Government Plantations for preparing copra is very successful if the green cloves are spread at the rate of $1\frac{1}{2}$ lbs. per square foot, turned over at intervals, and the temperature not allowed to rise above 60° centigrade. Under these circumstances the cloves dry out to a moisture content of 10 per cent (drier than required by the decree) by the end of the second day—actually only being hot for about 12-15 hours—and present a very good appearance, better in fact than the sun-dried article.

Analysis of material thus produced shows that there is no material loss in oil—our material yielded 19 per cent essential oil with slightly less than 10 per cent moisture.

It is proposed next season to utilise the copra kilns on Government Plantations whenever the weather interferes with sun-drying. It is worthy of note that after the first few days of careful attention by Mr. Raymond or myself the kilns were left entirely in the hands of the native plantation staff and not a single clove was damaged. The remarks on this subject in my last annual report were too pessimistic though it must be remembered that our native staff is perhaps more disciplined than that found on plantations generally.

The natives themselves were enthusiastic over the matter and consider that we need no longer trouble about the weather in clove harvest time. The produce commands a premium on the market.

E. REGENERATION OF CLOVE PLANTATIONS.

F. LOCAL DISTILLATION OF CLOVE OIL.

Attention has continued to be paid to these important matters and it is confidently hoped that before the end of another year definite knowledge of the economic position in relation thereto will have been acquired.

Section III.

THE COCONUT AND COPRA INDUSTRY.

A. FINANCIAL ASPECT.

The Coconut and Copra Industry has suffered a severe reverse during the year as will be seen from the following figures kindly supplied by the Comptroller of Customs:—

Month.	Average price per frasila.	
1929.	Rs. Cts.	
January	...	4 12
February	...	3 75
March	...	3 75
April	...	3 75
May	...	3 75
June	...	2 50
July	...	2 50
August	...	2 62
September	...	2 62
October	...	3 00
November	...	2 88
December	...	3 00
1930.		
January	...	2 97
February	...	3 50
March	...	3 00
April	...	3 12
May	...	3 40
June	...	3 00
July	...	2 81
August	...	2 69
September	...	2 70

The average prices during the previous six years were as follows:—

Year.	Average price.	
	Rs. Cts.	
1923	...	4 82
1924	...	4 85
1925	...	4 49
1926	...	4 34
1927	...	4 19
1928	...	4 27

Except on occasions during the War when shipping was not available it is over twenty years since copra was as low as at the present time.

In the case of cloves we can do something to help ourselves when prices fall below the economic level by holding stocks off the market but with copra Zanzibar's contribution, amounting to less than 1 per cent of the world's production, does not in the slightest affect the price and we are utterly helpless.

The reasons for the general slump in prices of nearly all raw products are somewhat recondite. The world has recently been experimenting in diverse ways; in one quarter it has been trying the effect of heavy financing without realisable security; in another part trials are being made of causing industry to support labour which it

cannot employ; generally there is a tendency to form combines with the object of cheapening production. As might be expected all these gigantic financial and industrial experiments cannot be entirely successful at the first assay and the effects of their operations must from time to time cause unexpected and undesirable repercussions. Again there is perhaps not sufficient study given to the rate of increase in world demand for commodities before enterprise, enthusiasm and capital embark on their production.

In regard to the vegetable oil industries the effects of combination or "rationalization" must undoubtedly have played a part in bringing down the price not only of coconut but other oils used in the soap and margarine industries.

Rationalization, as stated before, must have as its very essence the equalization of production and demand, and it must therefore be extremely difficult for a powerful combination dealing with raw materials which it does not produce, but the consumption of which it to some extent controls, to maintain a satisfactory position for the producing industry scattered as it is all over the world. Unless the proper interests of the producers are considered capital must withdraw from production and peasantry revert to cultivation for their own requirements only. It is probably realised by the vegetable oil combines that to secure permanent future supplies it may be necessary to fix prices on a cost of production basis and not jeopardise future supplies by taking advantages of the ignorance and helplessness of the majority of tropical producers. If the slump is actually due to over production of vegetable oils the position should very largely rectify itself in another season as the fall in price will have had a discouraging effect upon the planting of oil seeds. If it should transpire that oil can be more cheaply produced from other crops and the price of copra therefore be permanently lowered from the position it has held for so many years the existence of a very large industry is threatened.

The only thing that the coconut plantation owner or copra maker can do to meet such a situation is to reduce his costs of production.

The matter was discussed at a Council meeting of the Clove Growers' Association, the members of which are also coconut planters, and the existing rates of pay were scrutinised. After careful deliberation it was decided that certain reductions in rates of pay were absolutely necessary in view of the fall in price of copra. A schedule of rates was drawn up and a programme of public meetings arranged for the dissemination of the Council's recommendations.

Rates of pay for the different operations in making copra were not uniform throughout the country and the new rates did not in every case involve a reduction. Tree climbing, however, was the principal difficulty and this meant a universal reduction.

It was decided by the Association that a climber should receive three pice for every two trees climbed, instead of two pice a tree. This is practically equivalent to 42 trees for one rupee and enables the climber to earn from one to one and a half rupees per day. The reduction in pay of 25 per cent required careful explanation to the climbers who are a somewhat independent body of specialised workers. As President of the Association I addressed thirteen public meetings in different parts of Zanzibar Island and subsequently addressed three Association Council meetings in Pemba. It was pointed out to the climbers that one nut per tree climbed was the old traditional pay for getting the nuts down. That point being conceded it was only necessary to ask the price of nuts on the ground in the different districts. They then realised that nuts would have to be fetching Rs. 31 per 1000 on the plantation if they were to be paid two pice a tree. When nuts fell to Rs. 25 per 1000 the value of a nut was one and a half pice. Actually nuts are only Rs. 17 to Rs. 18 per 1000. It was impressed upon them that their interests would be watched and that when nuts again reached Rs. 31 per 1000 they would be given 2 pice per tree, and if they reached Rs. 40 per 1000 then 2½ pice. One or two climbers very shrewdly said that they would prefer to carry on at two pice a tree and would not ask for more whatever the price of nuts should reach in the future!

There was a little hesitation for a time. Climbers on Government Plantations agreed subject to private owners paying the same. One or two districts were almost at a standstill for a month or so but by the end of that time the new rate was definitely established.

Half a pice a picking means two pice per tree per annum. On 2½ million trees this represents nearly eighty thousand rupees saving to the industry—a notable achievement upon which the Clove Growers' Association may well congratulate itself.

The old and new rates of pay in connection with climbing and copra making are as follows:—

	Per 1000 nuts.	
	Old.	New.
	Rs. As.	Rs. As.
*Climbing	... 3 2	2 6
Gathering say	... 0 8	0 8
Transport to clamps	... 2 8	2 0
*Husking	... 1 8	1 4
*Breaking and Drying	... 2 8	2 0
Transport of Copra	... 1 0	1 0
Marketing	... 0 15	0 15
	— —	— —
	12 1	10 1
	— —	— —

*These rates definitely fixed by agreement in the new scale, the other figures vary slightly with local conditions. At the present time in Zanzibar the actual cost of copra production, tree-top to the purchaser's godown in Town is very generally Rs. 10 per 1000 nuts, equal to Rs. 62 per ton.

At Rs. 2-70 per frasila, the producer receives Rs. 172-8 per ton, leaving Rs. 110-8 for plantation costs, supervision, interest on capital and profits, if any.

In this country it takes about 150 bearing trees to produce one ton of copra per annum. Were plantations regularly planted and all the trees in bearing this number would represent three acres of land.

With the haphazard planting of nuts which has been the custom here it is commonly found that not more than 65 per cent of the trees on a plantation are regularly bearing and that although there is frequent overcrowding it takes generally 4 acres at least to produce a ton of copra. Allowing plantation expenses at Rs. 10 per acre we have Rs. 40 to deduct from the Rs. 110-8 gross profit from sale of copra leaving some Rs. 70 to pay for general overhead charges and interest on capital. The latter item would amount to Rs. 1,050, the value of 150 trees at Rs. 7 each, but actually the stock of trees on our four acres is valued higher as the interspersed young trees are necessary to maintain the stand. Including young and non-bearing trees the capital value would be 20 per cent more, say a total of Rs. 1,250. We see, therefore, that it is possible that the owner might have Rs. 70 left in his hand from the Rs. 172 realised during the year from his Rs. 1,250 investment. As that is only $5\frac{1}{2}$ per cent one could not complain if it were charged as overhead for his own recompense leaving nothing whatsoever for interest on capital.

That represents the picture of the coconut industry in Zanzibar at the present price of copra. In Pemba it is worse as the new rates of pay have hardly yet become general and previously Pemba rates were higher than in Zanzibar. The Pemba owner has not even that Rs. 70 per ton with which to recompense himself.

As I have stated Zanzibar contributes less than 1 per cent of the world's copra supply. Taking that supply at one and a half millions tons per annum there will be at least 225 million trees concerned in its production—there will of course be many more whose produce is consumed locally. The value of palms must vary considerably, but in general we may say Rs. 7=10/- may be taken as an average price for bearing palms.

I suggest that at the present there is in the world capital to the extent of over 100 million pounds sterling invested in the coconut industry which is now earning no dividend. Other countries may be more fortunate than this in having lower costs of production and it is to enable comparisons to be made that our costs have been given in full.

For the industry to be a good paying proposition in this country the price of copra should be locally not less than Rs. 4 per frasila, say £20 per ton f.o.b.

The quantity of locally produced copra exported in the calendar year 1929 was 11,629 tons = 7,44,246 frasilas. Table VII in the appendix gives comparison with previous years in regard to quantity and price.

B. QUALITY OF COPRA.

In my last Annual Report attention was drawn to the unsatisfactory quality of the copra produced in this country.

To explore the position further and to make recommendations to Government as to the advisability of applying the Agricultural Produce (Export) Decree, 1929, to copra, His Excellency appointed a Committee consisting of representatives of the Arab plantation owners, Indian and European merchants, the Comptroller of Customs and Director of Agriculture.

After careful consideration this Committee unanimously recommended that the decree should be applied to copra and suggested certain tentative standards of quality with which copra for export should be required to comply

This Committee was also invited to make recommendations regarding the suppression of predial larceny which at present is so prevalent and constitutes a serious handicap to the industry.

Recommendations on these matters were made, but not before the rank and file of plantation owners and other copra makers had been consulted.

Taking advantage of the opportunity afforded by the public meetings in connection with the reduction in costs of production the subject of improvement in quality of copra and the best steps to take to reduce nut-stealing was introduced on these occasions. The interested parties were aware of the advantages which have resulted from the inspection of cloves before export and were ready to believe that it would be advantageous to improve the quality of copra. There was, of course, a fear in their minds that Government would set up standards with which they could not comply, but assurance was given that what was intended was merely that all copra should be properly dried before it was exported and that it should not contain an excessive amount of immature nuts or burnt meat—matters which they could arrange without great difficulty and without additional expense to themselves.

There was everywhere a willingness to endeavour to comply with whatever Government required, and the Committee's recommendations with regard to action against stealing were received with enthusiasm.

The present position is, therefore, that all sections of the community endorse the proposal that copra should be improved in quality by the enforcement of reasonable standards to be effected by inspection at the time of export.

Section IV.

THE CLOVE GROWERS' ASSOCIATION.

A. WHAT IT IS.

The "Official Gazette" of the Zanzibar Government on the 30th April, 1927, notified recognition of the Zanzibar and Pemba Clove Growers' Association as the organisation through which direct assistance to the agricultural industry would be given by Government. That may therefore be taken as the actual date of the establishment of the Association though it was some two months earlier that a mass meeting held in the offices of the Agricultural Department had unanimously approved the formation of such a body and given assurance of loyalty to the Association. We are therefore concerned with the activities of this Association during the third year of its existence.

Before describing what the C.G.A. has done it may be well to state what it is, particularly as even in Zanzibar there is much ignorance on the subject and the most authoritative legal opinion is that it does not exist!

When the Arab goes to war the chieftain tells his tribesmen the general plan of attack and they all sally forth. Each man retains his individuality and initiative. If the enterprise meets with unexpected resistance the attackers vanish into thin air. The Arab is almost the only race of mankind which has never been vanquished, and this is largely because its "army" does not exist.

The Arabs are quite good at concerted action but they resent curtailment of individual liberty. They will help each other in fighting, but will not agree all to stand or fall together.

If I have rightly interpreted Arab character it is not only advisable but necessary to explore methods for the betterment of their position in accord with the genius of the race before attempting to force upon them a more highly organized system of co-operation however successful such has shown itself to be in Denmark, Ireland, Italy or even India. The way is being prepared.

As at present constituted the Association is an organisation primarily for the initiation of concerted action and secondarily for providing means for effecting such action. The success of any enterprise initiated by the Association depends entirely upon the voluntary action of the individual members, who are under no kind of compulsion or obligation, beyond a moral one, to take their part in general action.

Just before the abolition of the bonus on bearing clove trees it was arranged that all those receiving bonus should make a declaration of membership of the Association and agreement to conform to the rules thereof. Over nine thousand names had thus been taken.

when the bonus was discontinued. Although declarations of membership were never completed and the machinery does not at present exist for registration of all plantation owners, it is claimed that the Clove Growers' Association is actually an association of all the plantation owners of the country for the purposes of receiving Government assistance and initiating concerted action for the welfare of the industry.

The organisation consists of nine district committees in Zanzibar and 25 in Pemba chosen by the plantation owners themselves. Each Committee chooses a Chairman and the Chairmen, together with the Director of Agriculture (President), the Provincial Commissioners of Zanzibar and Pemba (Vice-Presidents), and the Assistant Director of Agriculture (General Secretary), constitute the Council of the Association. In Pemba the District and Agricultural Officers very frequently deputise for the Provincial Commissioner in presiding over meetings of the Council in that Island.

Questions of interest to plantation owners are brought forward by members of the Council and proposals are subject to careful consideration.

B. REDUCTION IN COSTS OF PRODUCTION.

Attention has already been drawn to the action of the C.G.A. in standardizing rates of pay in the coconut industry, and in a previous Annual Report similar action in regard to the clove industry was referred to. The precarious financial position of the plantation owners made these measures absolutely imperative. Moreover standardized rates of pay are more satisfactory to the labourers themselves even though at times these have to fall with the value of the produce. With different rates of pay in operation labour wasted much time wandering about to find the best paid job, and a somewhat lower general rate does not necessarily mean that an individual is unable to earn as much in a season as formerly. There is more sustained work done when wages are standardized and there can be no contentment without it.

It is, of course, no part of the duty of ex-officio members of the Council to determine rates of pay in the agricultural industry; that is done entirely by the Chairmen of the District Committees. Different Districts sometimes have slightly different rates of pay, such being agreed to by the whole Council when special circumstances—supply and demand of labour, difficulty or ease of harvesting—are considered to warrant departure from the general rate. It is curious to note that the Arab, formerly a slave-master, is generous to the point of folly in his payment of wages, though sometimes the labourers have to wait a considerable time for their money. Harvesting expenses have always been far too heavy, and without some kind of agreement as to rates of pay competition ran the cost up to such a ridiculous amount that as much has been paid for picking cloves off the trees as they were worth. It is safe to say that standardization as now practised—the rate paid is subject to frequent change

during the progress of the harvest, of course—has reduced the average cost by at least two pice ($\frac{1}{2}$ d) per pishi (two-thirds of a gallon) of green cloves picked and this represents on an average crop of six lakhs of fraslas nearly five lakhs of rupees (£37,500).

The C.G.A. is the successor to the Arab Advisory Committee which I asked the Arab Association to nominate in 1924, and the good work undertaken by that body can be claimed for inclusion in a review of what the Arabs have accomplished in concerted action. That first effort, which led to the formation of the Association, was the standardization of rates of pay for plantation weeding. In many cases the increase in the amount of work for a given wage reached 50 per cent as shown in the Annual Report for 1924, and the amount of cleaning done in the country increased accordingly. We see, therefore, that whether the Association has any legal existence, or otherwise, it is a powerful force in the country and has already accomplished the reduction in cost of production of cloves and copra by at least 20 per cent.

The recent fall in the price of copra has again made coconut plantations unprofitable, and the improvement in the cleanliness of shambas which was noticeable a year ago has had a relapse, but had it not been for these successful efforts in concerted action the present position of the plantation owners would have been an impossible one.

C. FINANCING AND MARKETING.

There is probably no country in the world where the planters' income is so variable as in Zanzibar. The year 1930 has seen the price of many commodities fall by 25 per cent or more, and something approaching a crisis resulting therefrom. The agricultural community in Zanzibar has for three or four generations of men had to suffer very frequent repetitions of even greater variations in the price of its principal production.

It is remarkable that although the State derives a great part of its revenue by direct taxation of cloves there has not as yet been provided a system of credit to enable the producers to survive conditions which would have ruined planters in almost every other country. The necessity for considerable capital in the production of a slow maturing crop of great variability in yield is very apparent to those acquainted with agricultural economics, but it seems to have escaped the notice of those not directly in touch with the industry.

From the earliest times the Indian dealer has financed the producer, and had he not done so the agriculturist could not have continued the cultivation of such an erratic crop as cloves. However unpopular money-lenders may be in this or any other country it is very certain that few industries can be carried on with only the actual producers' own capital. Any grievance arising from the cost of money (interest charged) is at bottom due to the unsatisfactory nature of the security. It is noteworthy that although the rates of

interest charged on mortgages, etc. in Zanzibar are continually being condemned as scandalous no enterprise has attempted to undercut the existing money-market.

In a small way Government has for several years afforded direct financial assistance to clove growers by making loans free of interest for harvesting expenses and by affording storage accommodation and advances upon cloves stored, also free of interest.

The year 1929 showed a greatly increased activity in these directions. The Clove Growers' Association has become better known and the members have been encouraged to take advantage of the assistance which Government is prepared to give them. Comparisons between the years 1928 and 1929 appear in table 1A in the Appendix.

Briefly the position is that during the twelve months ending 31st December, 1929, loans amounting to Rs. 1,71,431 were made, and during the period 1st January to 30th June, 1930, a further Rs. 13,800 were loaned. These loans are for short periods only and on the 30th June, 1930, the amount outstanding was only Rs. 5,751-83 cents.

In general the Harvesting Loans are converted into Advances on cloves deposited with the Clove Growers' Association in the course of the harvest, it being one of the conditions of obtaining a loan that the produce shall be brought to the Association for storage or immediate sale—a condition also required by many of the Indian money-lenders who are also shopkeepers or otherwise engaged in trade. It is necessary that whoever finances the crop should handle the produce. The Association was not the first to discover that principle but experience has shown it to be sound. Many growers are unable to avail themselves of the advantages of the Association because they have already been financed outside and cannot therefore undertake to bring their produce in. Only slowly can this form of assistance liberate producers from their financial entanglements.

The Association undertakes the marketing of cloves for members, charging 1 per cent commission and actual expenses. During 1929, 21,898 fraslas and during the first half of 1930, 7,508 fraslas were received for immediate sale.

The most important branch of the work was the warehousing of cloves and the issue of cash advances against them. In some cases no cash advance was desired but in the great majority of cases these payments were made. In the first place advances were limited to Rs. 5 per frasla but later the limit was raised.

During 1929, 40,634 fraslas were accepted for storage upon which Rs. 1,90,324 were advanced. During the six months ending 30th June, 1930, 30,729 fraslas were accepted and Rs. 3,19,664 advanced.

The position on 31st June was that some 58,924 fraslas remained in storage upon which had been advanced Rs. 4,35,196.

The enormous development in the activities of the Association found the Agricultural Department but poorly equipped to meet the situation. It has been an experiment in "rationalization" but on a dangerously large scale considering the limited experience of all engaged in it from the Director downwards. It proved a very trying and anxious time for the whole staff, but experience has been gained and in future it should be possible to carry through such a season without any trouble.

Having seen the extent of the operations let us consider what advantage has accrued to the clove producers.

Taking the value of the cloves stored at the time of delivery as the average sale price obtaining on that day the total value of the C.G.A. cloves when received from members amounted to Rs. 10,40,895. Valuing the stocks held on 30th June, 1930, at Rs. 16½ per frasla and adding thereto the cash received from stocks already sold the total amounts to Rs. 12,97,349, giving a profit of Rs. 2,56,454 to the members. The price of cloves has risen considerably since that valuation and it is highly probable that the members' profit will exceed 4 lakhs of rupees.

It is difficult to assess the cost to Government—interest on money, interest on capital of godowns and salary of staff—but when it is considered that nearly 59,000 fraslās were carried forward when the Excise Duty changed from Rs. 3-30 to Rs. 4-50 per frasla it will be seen that some Rs. 70,000 additional revenue will accrue to Government, which should more than pay the expenses.

The Clove Growers' Association with its financing and marketing business amounting to some 15 lakhs of rupees (£112,500) in the season may well claim to be one of the largest commercial concerns in the country, and it is not improbable that its profits entitle it to take premier place. The Department of Agriculture, which is responsible for the business activities of the Clove Growers' Association, has also the management of the Government Plantations and as will appear later in the report has the pleasure to report a profit to Government of over two lakhs of rupees for the twelve months ending 31st December, 1929. The total profits arising from the activities of the department are at least Rs. 4½ lakhs of rupees and by the end of the present season are expected to be over six lakhs, this profit being distributed over practically 24 months operations.

Section V.

EXPERIMENTAL WORK.

A. GENERAL OBJECT.

The two Islands of Zanzibar and Pemba are almost exclusively given up to the production of cloves, coconuts and native food stuffs.

Some idea of the relative state of development of the country will appear from the following comparison :

Country.	Area sq. miles.	Population.	Value of Exports.	
			Per head.	Per sq. mile.
			£ s.	£
Fiji	7,083	1,57,000	12 4	282
Barbados	166	1,68,000	9 13	9,656
Mauritius	720	3,76,000	9 8	4,912
Zanzibar	1,020	2,16,000	8 10	1,792
Ceylon	25,000	45,01,000	7 10	1,374
Seychelles	60	24,000	6 15	2,700
Jamaica	4,400	8,58,000	5 13	1,086
Cyprus	3,584	3,10,000	5 00	430
Dominica	304	37,000	4 4	510
Kenya	2,25,000	28,47,000	2 8	31
Uganda	79,000	31,57,000	1 00	40
Tanganyika Territory	3,54,000	43,40,000	0 15	9

Let it at once be stated that the above figures, based on official returns, represent the position at one particular time—two years ago—and must necessarily alter from year to year. Also the statistics of value of exports do not enable an exact estimate of the value of domestic agricultural produce to be made. In some cases the value of other produce or re-exportations may be considerable. Actually in the case of Zanzibar the value of domestic produce exported was £6 per head of the population, the rest being due to our entrepôt trade.

These figures do, however, clearly indicate that Zanzibar is fairly well developed agriculturally—in fact it may be proclaimed a triumph for Arab colonisation (there being no European capital or control of production in the country).

Proud as we may be of our position let us not forget that there are other islands where the value of produce exported is greater per head of population than here. Increase in value of exports may occur through improvement in price or production of either or both of our existing crops—cloves and coconuts—or through the introduction of some other crop, and both channels require exploration.

B. CLOVES.

As regards cloves the experimental work which has been attempted is as follows:—

1. Application of artificial fertilisers.
2. Liming.
3. Topping old trees
4. Thinning out in dense plantations.
5. Different methods of regeneration.
6. Grafting.
7. Effect of cultivation of soil on trees

The results to date are briefly as follows:—

1. There is danger of nitrogenous manures forcing young clove trees up into tall weak plants which fall over in the wind. Basic slag in a former experiment caused young trees to develop exceedingly well and come into bearing in 3 to 4 years. This year these young trees suffered more than others from the long drought and it may be that the manuring caused a greater development of branch and leaf than the root system could supply with moisture. Manurial experiments are being continued on young trees at Makondeni, Pemba.

A trial of potash, phosphate and sulphate of ammonia, on trees which were failing did not arrest in any case the decline, but regular applications of fertilisers to healthy stands of trees have not been made as yet.

2. Liming at Makondeni ($\frac{1}{2}$ ton per acre) did not make any observable difference with young trees, but on old trees at Machui it was thought that a slight improvement could be detected. Determination of the PH value of the soil in different areas is required to ascertain the condition obtaining in the most healthy plantations.
3. Topping old trees was carried out to test their capacity to form new laterals, and also to give more light to adjacent trees. It has proved unsatisfactory. A large proportion died outright and the others will not make good trees. Younger trees may be topped but in many cases there seemed to be more tendency for the tree to put its energy into throwing up new branches on top instead of developing the lower branches. There is a loss of crop for some time and the new branches are weak. Further and more systematic work requires to be done on the pruning of clove trees.
4. Thinning out in dense plantations has been shown to be beneficial when the trees have not lost their lower branches entirely. In a regeneration experiment carried out several years ago at Machui this improvement was most marked, but observations along the new roads where old plantations have been cut through indicate that exposure to light may come too late to be of any use to the trees.
5. Two systems of regeneration by felling either alternate rows or alternate trees in the rows were tried years ago and the results very clearly indicate that these methods are quite wrong. The department has been regenerating clove areas at Mgongowagamia in Zanzibar and Mtangatwani in Pemba by clear felling. Also on the leased plantations of Masingini and Dole, on land which had not been replanted after the cyclone in 1872 and had become a dense thicket including

some fairly large forest trees, a great deal of clearing and planting has been done. All these replantings are providing opportunities for experimentation in methods.

The great problem is conservation of soil moisture. The original plantations were established with slave labour and watering of the young plantings was regularly carried out. With paid labour such becomes an economic impossibility. The general practice is to erect palm leaf shades over the young plants and keep the top soil round the plants stirred in dry weather. The shades are often too small and frequently blown away. Pigeon-pea as a shade crop has been tried extensively but is not entirely satisfactory. Young trees in a plot where natives were encouraged to cultivate hill-rice seemed to do remarkably well, and in regeneration it would seem to be eminently desirable both from the economic point of view and in order to develop the young trees that native food-crop production should be encouraged in young plantations, unless some subsidiary crop for export can be profitably introduced.

6. Approach grafting has been attempted and has proved impracticable. Only in a few cases was union effected and a single sickly individual is all that survives. Budding has in no instance been successful.
7. Different methods and amounts of cultivation are being tested, not so much to increase production as to lower the cost thereof. The effect upon the trees is of course noted. These experiments are part of the general scheme of detailed costing introduced two years ago. It will take some time to ascertain exactly how much cultivation pays best and the importance attaching to aeration of the soil. The disc harrow work is giving indications of being the most satisfactory at present.

C. COCONUTS.

As regards coconuts the principal advances to record are the selection of trees for seed purposes and the continued improvement in copra making. Palms are selected not only on their individual merits as heavy bearers but also as regards the type to which they belong.

Variations in the construction of drying kilns are continually being made to ensure more even drying and to reduce cost of construction. This work is now of the highest importance in view of the proposed application of the Agricultural Produce (Export) Decree to copra. Although continuing to be experimental work a point has been reached when with confidence advice can be given to the copra makers, and during the campaign throughout the island, already mentioned, when producers were warned of the necessity of improving their copra, the construction of our kilns was described and

an invitation given to all to visit our plantations to see them operating.

D. MISCELLANEOUS.

The principal experimental trials made of subsidiary crops were as follows:

1. Citrus fruits.
2. Robusta coffee.
3. Cacao.
4. Hydnocarpus and Taraktogenus (Leprosy trees).
5. Chillies.

The results have been briefly as follows:

1. The young citrus trees imported from South Africa November, 1928, and planted out at Kinaoni and Dunga, all made very good progress.

There was a mishap at Kinaoni where grease bands were put round the stems to check insect attack. An unsuitable grease was used which penetrated the paper wrapping and caused ring-barking of the young trees. Most of them had to be cut right back and many failed to throw buds from the small amount of scion wood left. The gaps thus caused will be filled by locally budded material. At Dunga the same series of citrus fruits were not subject to this set back and have developed extremely well.

The varieties planted are as follows:

* A. GRAPE FRUITS.

1. Ellen
2. Triumph
3. Cicely
4. Foster
5. McCarthy
6. Marsh's seedless

B. ORANGES.

1. Du Roi
2. Valencia
3. Mediterranean Sweet
4. Jaffa
5. Joppa
6. Washington Navel
7. Pineapple
8. Lue-ging-gong

All these imported varieties are doing well saving those individuals which were accidentally ruined or damaged by the grease.

Planted out in November, 1928, many of them are already commencing to bear. It is perhaps from the Grape Fruits—the really tropical citrus—that most may be expected and up to the present the growth has been extremely good.

Scale insects have caused some trouble on the plants adjacent to a line of coconut trees but generally the young trees are sufficiently vigorous to withstand this pest.

Nursery beds are being made to raise stocks for grafting and experiments will be made with different stocks to ascertain the kind most suitable for this country. Experience so far is that Rough Lemon stocks have made more growth than Sour Orange but continued experiment with these and other stocks is necessary.

Citrus and particularly Grape Fruit, is the most promising of the subsidiary crops with which we have experimented.

Selected local oranges have also been budded, and it only requires additional staff to work up a regular supply of grafted trees for sale to plantation owners.

2. The Robusta Coffee has not done well, due to insufficient shade and infestation of the land with the obnoxious nut-grass. It has done better in Pemba than in Zanzibar. It is well worth continuing the experiment in different situations and under different conditions.

3. The Cacao has been generally a failure. Before attempting further planting adequate shade must first be grown.

4. *Hydnocarpus anthelmintica* is doing very well both in Zanzibar and Pemba. It is, of course, doubtful if this crop is to be regarded as a commercial proposition. *Taraktogenus Kurzii* has proved much more difficult to rear and attention is now being directed to *Hydnocarpus Wightiana*, seeds of which are now germinating in nurseries.

5. Chillies produced a heavy crop at Kinaoni but could not be harvested economically. Attempts to brush or comb the pods from the branches failed, and labour requires almost the value of the produce for picking. It is quite obviously only possible to produce chillies here as a peasant industry.

Observations on the trials with various crops in Pemba are made in the reports of the Agricultural Officers stationed in that island, and a summary of operations in Zanzibar and the costs thereof will be found in the Appendix.

The development of any new industry depends upon labour, land and capital. As regards labour there is already a shortage and unless mechanical means can be employed (as is done at Selem with tractor cultivation) extension can only be made if the natives have an incentive to work longer hours than at present. As regards land it is undoubtedly the case that practically all the good land, and other as well, is already carrying cloves, coconuts or food crops, but there is wastage through careless planting. Then there is a certain amount of poor land upon which neither cloves nor coconuts will thrive and which is seldom or never requisitioned for food crops. It

is possible that a remunerative crop may be found for this land if labour is available. Lastly, there is little capital in the country for clearing and planting. It would seem most probable that any new crop would have to be in the nature of a fill-gap and not one requiring extensive areas for its economical working, unless the coral "wanda" country can be exploited.

Section VI.

PLANTATION INSPECTION.

With the passing of the bonuses on bearing trees and seedlings the counting of trees and verifying of claims, which formerly occupied the attention of a staff of subordinate sub-inspectors and assistant sub-inspectors, has ceased, and to a large extent that staff has been transferred to produce inspection. The Inspector of Plantations, Sheikh Mohamed bin Seif el-Busaidi had occasion during the year to muster all his resources to urge plantation owners to take steps to protect their property against a threatened invasion of locusts which in March, 1929, were moving in great swarms about the mainland opposite. Two swarms were seen to approach but neither reached Zanzibar though many thousands of individuals landed in various parts of the island.

To a certain extent the plantation owners prepared heaps of rubbish along their boundaries ready for lighting if required, but it was quite obvious that had a swarm come these slight scares would not have had any effect. The effort was not wasted, however, as the clearing of boundaries is every year required as a protection against grass fires.

A sub-inspector has been engaged on the inspection of dealers' licences and many shopkeepers in the country districts have been found trading in cloves or coconuts without being licensed or keeping the register of transactions as required by law. During 1929, 46 cases were taken to Court and 37 convictions obtained.

A sub-inspector has also been employed in calling upon loanees to refund their loans, and in reporting the harvest prospects on the plantations of those asking for harvesting loans.

The Inspector of Plantations acted as Manager of Plantations during the absence of the Manager, March to July, 1929, and during February, 1930, when the latter was acting Assistant Director.

Reports by the Agricultural Officer's in Pemba for January-December, 1929, and January-June, 1930, the report of the Manager of Plantations and the report of the Chemical Laboratories follow.

V. H. KIRKHAM,
Director of Agriculture.

ANNUAL REPORT OF AGRICULTURAL DEPARTMENT,
PEMBA, 1929.

The Pemba staff was distributed as follows during 1929. Mr. Waterland was in charge until May 24th and Mr. Baker for the rest of the year. The southern district was in charge of Mr. Baker during January; for four months there was no second officer in Pemba; Mr. Soper returned from leave and took up his duties at Wesha on May 27th.

During the year under review, experimental work commenced in 1928 was continued and amplified; by the end of the year much useful data resulted. Experiments were made with different tropical crops with a view to planting up quite extensive areas of land not under cloves or coconuts, these areas not being suitable for cloves.

A small area of cacao was planted up at Makondeni Government shamba and made good progress, but insect pests, chiefly white ants, completely destroyed the young plants and the experiment was abandoned on that particular area.

An acre of *Hydnocarpus anthelmintica* was planted up at Makondeni and these trees did remarkably well; *Cajanus indicus* was used for temporary shade and proved sufficient.

Seeds of *Taraktogenus Kurzii* were sown in nurseries at Makondeni and Wesha and over 50 per cent germinated. The young plants were healthy and made good progress.

An experimental area of coffee was planted out at Wesha early in the year. *Cajanus indicus* and bananas were used as temporary shade. The coffee plants made rapid growth.

Experiments with budded citrus were commenced both at Weti and Wesha in 1928, seeds of the local rough lemons and bitter orange being used for stocks. This work was very successful and by the end of 1929 about 40 young grape fruit and orange trees were planted out in Weti, Makondeni and Wesha.

Difficulty in obtaining sufficient seeds of various plants was experienced during the year, with the result that the experimental work did not make as much headway as it might have done.

Clove Seedling Bonus.—A system of compounded payments was introduced in order to settle all outstanding claims at once, and so finally close this bonus scheme. No payments were made after October, 1929. A statement of the payments made is attached.

The scheme proved unsatisfactory in more ways than one. It grew year by year to such vast proportions that the work fell into arrear and it also gave opportunities for all sorts of abuse. At the

same time it certainly resulted in many thousands of young trees being planted, although it is probable that better results could have been obtained by less costly methods.

Clove Growers' Association.—The clove crop during the year 1929 was a particularly heavy one, and the Clove Growers' Association operated actively for the first time in Pemba. The three big transit godowns, one at each port—Weti, Wesha and Mkoani—were handed over to the Association for storage purposes, and three motor lorries were employed for transport. These worked regularly without a single breakdown. Picking rates started at six pice per pishi and as the harvest proceeded gradually rose to nine and 10 pice. On the whole the rates fixed by the chairmen of District Committees of the Association at meetings, held frequently to discuss this and other matters were generally observed, but some cases were brought to our notice—chiefly in the Chake Chake Districts—where the growers were paying more.

It was decided to pay an advance of rupees five per frasila on all cloves deposited in the C.G.A. godowns. This was particularly welcome to growers during a heavy harvest, and, together with loans paid out by the department for harvesting, enabled most of the members to pick their crops without having to borrow from money lenders at high rates of interest. Harvesting loans were made to growers free of interest for the first three months, after which 1 per cent per month was charged. This arrangement proved very acceptable to members, some preferring to make use of the loans beyond the free period, and pay the interest. All members who took loans agreed to bring in cloves for sale through the C.G.A., but many did not do so, with the result that some loans are still outstanding. Now that the C.G.A. is well known in Pemba, I do not think these difficulties will arise again. The chief reason why many of the smaller shamba owners did not deposit cloves was that they had mortgaged their shambas to money lenders, and, as has been the custom for many years, all produce from these shambas was taken by the money lenders to pay off the mortgages. It was not known that people had mortgaged their shambas when they applied for loans, and the guarantee of chairmen or Mudirs that a man is a fit and proper person to receive a loan is of very little use. These difficulties cannot be overcome all at once, but it is hoped that with the growth of the C.G.A., many of these people will be put on their feet again. Promissory notes are really of little use as the majority of the people will sign any paper provided they get ready cash by doing so.

The C.G.A. has gained a sound footing in Pemba and is generally popular. During the season troubles arose at times chiefly in connection with staff and advances. For several long periods no advances were made as funds did not permit, Government being apprehensive of advancing the large sums required. Extra staff was

required for accounting work and to try to guard against people taking harvesting loans without bringing in cloves to the C.G.A.

An annual statement is submitted herewith showing the working of the Association up to the end of the year. The number of growers who took loans in Pemba amounted to 1,198 and the amount disbursed was Rs. 97,132. The chief reason for this very big increase on previous years is the abolition of the bearing tree bonus. Also there was an exceptionally big crop.

The harvest was earliest in the Mkoani district, but cloves were soon being received in all three godown. The tendency in the Wesha district was to ship quickly to Zanzibar for storage or sale; at Weti and Mkoani the growers preferred to keep their cloves in the local godown. This resulted in rapid congestion, especially in Weti, where by the end of October 6,163 bags had been received. At a general meeting of the Association in November, the members agreed to have their cloves shipped to Zanzibar for storage and thus relieve the Pemba godowns. To enable this to be done two special steamer trips were made from Weti to Zanzibar and one from Mkoani. At the end of the year cloves were still coming in at Weti, but the harvest had ceased in the other districts.

Government Plantations.—All the clove and coconut crops were leased in Pemba in 1929, and almost all the lessees of the coconut crop paid up their quarterly rents regularly.

By the end of the year all the lessees of the clove crops with the exception of two had paid up the purchase prices and refunded all advances made for picking cloves.

All Government plantations were slashed and generally cleaned during the year, and on some of the older ones regeneration was commenced. This work will be continued during the coming year. It is intended to clear fell some of the older and poorer stands of cloves, and, after well cultivating and manuring the land, to plant up with *Cajanus indicus* or some other leguminous crop for green manuring. Clove nurseries were laid down in the principal plantations for supplying the needs of Government plantations only. Since the close of the seedling bonus no applications have been received for seedlings and therefore no provision was made to supply the public.

Repairs to houses and drying-floors were carried out chiefly in the Southern plantations. The building of a new type of copra drier was started at Tundaua towards the end of the year on the lines of the ones in use at Selem.

Clove Harvest.—The harvest was an exceptionally prosperous one during 1929 and at the end of the year harvesting was still in progress in the Northern Districts of the island. Harvesting first

commenced in the Mkoani District during July and was in full swing in the Southern Districts in August; it commenced actively in the Chake Chake district about that time, but in the North, on the other hand, harvesting did not generally commence until September. Picking first commenced in the North in the Piki and Mtambwe districts; in the latter a particularly heavy crop was produced. In November picking was in full swing in all districts North of Piki up to Matangatwani but was nearly over in the extreme South. Generally the crop was ready for harvesting in the districts South of Chake Chake three months before the Northern districts.

Several thousand pickers were brought up to Pemba for the harvest. On the whole harvesting was satisfactory; a certain amount of branch breaking went on as in previous years but not to a great extent. The price fixed for picking was generally observed and the C.G.A. was distinctly popular, especially among the bigger land-owners. Prices for cloves held at a good level for some time but began to fall towards the end of the year. The weather was exceptionally good during the harvest and cloves were generally well dried. Total exports of cloves from Pemba ports during the year are as follows:

Weti	172,882	frasslas
Chake Chake	176,566	,,
Mkoani	176,859	,,

J. E. BAKER,
Agricultural Officer.

TABLE I.

ZANZIBAR AND PEMBA CLOVE GROWERS' ASSOCIATION.

PEMBA.

Position of harvesting advances on 31st December, 1929.

DISTRICT.	No. of Growers received harvest- ing Advances	Amount Advan- ced Rupees.	Refunds of Harvest- ing Advances.				Total Refunds		Amount Outstand ing on 31-12-29.		Interest Collected.	
			Actual Refunds			R. funds by Con- version						
		Rs.	Rs.	cts.	Rs.	cts.	Rs.	cts.	Rs.	cts.	Rs.	cts.
Weti ..	527	52,705	33,077	41	4,328	00	37,405	41	15,299	59	517	32
Chake Chake ..	250	19,160	11,455	00	965	00	12,420	00	6,740	00	29	45
Mkoani ..	397	25,267	22,182	00	1,570	00	23,752	0	1,515	00	116	85
Total ..	1,174	97,132	66,714	41	6,863	00	73,577	41	23,554	59	663	62

NOTE.—The figure 1,174 in Col. I denotes number of growers who took advances and not number of advances given.

TABLE II.

ZANZIBAR AND PEMBA CLOVE GROWERS' ASSOCIATION.

PEMBA.

Position of Cloves Stored in C.G.A., godowns on 31st December, 1929.

DISTRICT.	RECEIPTS.			SHIPMENTS.			SALES.			STOCK ON 31-12-1929.		
	Number of Depositors	Number of Bags	Net Weight.	Number of Bags	Net Weight.	Number of Bags.	Gross Amount Realized			Number of Bags.	Net Weight.	
			Fras. lbs.		Fras. lbs.		R. cts.			Fras.	lbs.	
Weti ..	175	8,652	26,764 04	8,525	25,971 23	311	10,343 13	127	343	26		
Chake Chake	100	2,974	9,018 13	2,343	6,911 32	1,190	44,018 42	631	1,929	20		
Mkoani ..	37	3,565	10,042 12	3,565	9,731 18	736	25,271 16	..	..	..
Total ..	312	15,191	45,824 29	14,433	42,615 03	2,237	79,612 71	758	2,273	11		

TABLE III.

ZANZIBAR AND PEMBA CLOVE GROWERS' ASSOCIATION.

PEMBA.

Position of Storage advances to Clove Growers on 31st December, 1929

DISTRICT.	Number of Growers.	Amount Advanced.		Amount Refunded.		Amount Outstanding.		Storage Advances and Converted Harvesting advances Outstanding on cloves stored in			
								Zanzibar.		Pemba.	
		Rs.	cts.	Rs.	cts.	Rs.	cts.	Rs.	cts.	Rs.	cts.
Weti ..	144	1,22,160	45	345	..	1,21,815	45	1,16,558	45	3,000	..
Chake Chake ..	70	29,700	90	6,145	..	23,555	90	16,335	50	8,187	40
Mkoani ..	28	38,464	..	4,804	..	33,660	..	35,230	..	..	..
Total ..	242	1,90,324	35	11,294	..	1,79,030	35	1,68,123	95	11,187	40

NOTE.—The figure 242 in Col. I denotes number of growers who took advances and not number of advances given.

TABLE IV.

ZANZIBAR AND PEMBA CLOVE GROWERS' ASSOCIATION.

PEMBA.

Position of C.G.A., Motor Lorries on 31st December, 1929.

DISTRICT.		Number of Miles run by Motor Lorries.	Gross Weight Carried.		Amount Earned.	
			maslas.	lbs.	Rupees.	t
Weti ..	..	1,903	10,058	03	1,897	00
Chake Chake ..	..	1,752½	6,278	32	1,471	35
Mkoani ..	..	1,445	4,957	18	1,445	00
Total ..	..	5,100½	21, 94	18	4,813	35

Clove Crops of Government Shambas in Pemba for the season 1929-1930.

Name of shamba.	Bags.	Fraslas.	Lbs.
Makondeni ...	249	941	16
Mpona ...	48	159	13
Matangatwani ...	100	327	26
Makue ...	45	151	14
Juani ...	16	48	06
School ...	13	50	13
Bomani ...	10	34	25
Wakf ...	6	18	21
Daya ...	2	6	14
Tundaua ...	350	901	13
Wesha ...	102	256	11
Kungeni ...	16	46	01
Tibirizi ...	3	6	08
Fufuni ...	381	983	06
Kwamacho ...	17	59	00
Michenzani ...	6	23	25

CLOVE SEEDLING BONUS.

Bonus finally closed and amount disbursed in 1929.

Total Rupees 91,575-50 Cents.

AGRICULTURAL DEPARTMENT, PEMBA.

HALF YEARLY REPORT, JANUARY-JUNE, 1930.

Staff.—Mr. Baker was in charge from the beginning of the year till March 6th, when he went on leave; Mr. Soper was stationed at Wesha till February 28th, after which he took over from Mr. Baker.

Clove Growers' Association.—The Association carried on the activities outlined in the 1929 report, but clove deposits began to fall off in February. All cloves stored in Pemba were despatched to Zanzibar at the end of March, but a few consignments were still being received during June.

In April it was found that the system of duplicate book keeping was unsatisfactory, and all C.G.A. books were sent to head office.

Considerable difficulty was experienced in obtaining refunds of 1929 loans, but on July 1st only Rs. 2,534-44 cents was outstanding.

Government Plantations.—Coconut leases, except for Tundaau which is being operated, sold at very high prices, probably due to the fact that money was plentiful, but by the end of June it began to be apparent that many lessees would fail to pay their way.

Cloves leased very well on the shambas which were put up to auction, and all rents but one were paid up at once. Fufuni, Wesha, Tundaau and Makondeni were set aside to be picked by the department.

Matangatwani was set aside for clove regeneration experiments, and an area of about 5.6 acres is being prepared for planting; the cost for the half year including supervision was Rs. 666-90 cents. Two of the three acres of cloves felled at Fufuni in 1928 were replanted at 30×15 ft. during April, cover crops of muhogo, rice and "kunde" being used; the two latter failed owing to lack of rain in May.

Some areas of bush at Makondeni and Mpona were cleared early in the year with the intention of planting cloves. At the time of writing it has been decided to plant *Hydnocarpus* *Wightiana* on them instead.

Expenditure for experimental work, public nurseries and routine shamba work is now being kept strictly separate.

Experimental Work, Makondeni.—It was found advisable to abandon the cacao plot; the remaining trees were uprooted early in the year, and cloves were planted in March, the plot being utilised for manurial experiments.

The Taraktogenus nursery became waterlogged in the rains and the majority of the plants were set out in the plot in a weakened condition as being the best means of saving them at all. Up to the end of June they had *Cajanus* *Indicus* shade.

Hydnocarpus Anthelmintica has progressed favourably during the half year, but the castor cover failed.

Citrus budded at Chem Chem has been planted round the station and at Makondeni. At the former place aphids, black scale and to a certain extent purple scale have been very serious pests, and at the latter the infestation by purple scale has been extremely heavy: it has been controlled by castor oil-resin-amonia emulsion.

Pine-apples have been ruined by monkeys.

Wesha.—The coffee plot has done very well; the incidence of pests has been lessened very appreciably by thinning the shade.

Taraktogenus planted out in November has made notable progress: a cover of "kunde" was sown in April and spread well.

Citrus has made fair progress, grasshoppers, aphids and purple scale, being responsible for a certain amount of damage. It is felt that endeavours to grow citrus in Pemba need very careful and constant attention to ensure success; the critical period seems to be that between 6 and 18 months after budding, i.e. while branching in the nursery and while gaining a foothold after planting out.

Public Nurseries.—During this period public clove nurseries were in existence at Fufuni, Mkanjuni, Chem Chem, Makondeni, Mpona and Matangatwani. Roughly 4,000 plants were issued from Mkanjuni during April, May and June, but white ants had wrought havoc in all the beds, and applicants did not receive sufficient for their needs. The remaining nurseries will be ready for distribution either next "Mvuli" or "Masika"; they comprise about 13,000 plants.

Fire Belts.—An attempt was made to induce shamba owners to cut fire belts round their properties. Lack of labour proved a serious obstacle, and lack of funds another, but the general state of the shambas was far above the average.

General Activity.—While the two Agricultural Officers were both resident in the island the C.G.A. took up a very large proportion of their time. C.G.A. work and a more detailed management of government plantations, combined with the fact that the situation of the office necessitated a large expenditure of time in travelling, left the single Agricultural Officer very little opportunity of doing any other work.

J. R. P. SOPER.

Agricultural Officer, Pemba.

REPORT ON ZANZIBAR GOVERNMENT PLANTATIONS, 1929.

Staff.—The Manager of Plantations proceeded on leave on 5th March and returned on 23rd July.

Sheikh Mohamed bin Seif bin Salim, el-Busaidi, acted as Manager of Plantations during the period of his absence.

Finance.—The total Revenue for the year amounted to Rs. 408,850 which sum is exclusive of the revenue derived from the Divisions of Dole and Masingini amounting to Rs. 17,422-69 cents.

The total Expenditure amounted to Rs. 205,055, which sum includes the expenditure on Dole and Masingini, namely Rs. 12,966-57, and also a sum of Rs. 15,939 spent on Experimental and Departmental Charges. An actual profit of Rs. 219,725 was produced as a result of the year's working.

General.—General routine work was carried on throughout the year but little development was done since, once again, a scheme was set in motion to enable the government to rid themselves of the burden of the ownership of property. Thus, development was confined to planting cloves on Dole and Masingini, the two divisions leased from Meyya binti Abdulaziz upon which 6,663 seedlings were planted out. The Dole clearing of some 60 acres is the largest area carrying a pure stand of young cloves in the Protectorate, and it is interesting to note the marked differences existing in the soil regarding suitability for the development, or even existence, of the clove plant. One notes plots of varying sizes and shapes where the seedlings have shown good growth, cheek by jowl with areas upon which they have either died out, even after being gapped 2 or 3 times, or where anæmic and spindly specimens are produced.

This state of affairs can be seen amongst the old stands, the size of the good and bad areas varying with the locality.

An experiment was made in leasing all the clove crops instead of picking departmentally.

Good prices were obtained and, with the exception of 2 or 3 small areas where the licensee had overbid on the crop, all the rents were duly paid in.

The terms demanded were the payment of 10 per cent down, and the government took possession of all the produce until the total amount had been paid off.

The main points brought out by this scheme are as follows:—

(1) The majority of the licensees have no financial standing, thus, should the crop not produce sufficient to pay off the rent, there would be little, if any, hope of recovering the balance due.

(2) A great deal of supervision is necessary to prevent the licensee, who is doubtful as to the making of any profit, removing and selling the produce through outside sources. And also, the prevention of damage to the trees costs more in supervision than during departmental pickings.

(3) On the other hand it is probable that a greater percentage of the crop is picked.

To sum up, the scheme has advantages when the season's crop can be forecasted with a fair amount of accuracy.

No change was made as regards the plantations on which copra is made departmentally.

The coconut crops on the four properties so operated were as follows—figures for 1928 are given for comparative purposes

	1928.	1929.
Selem	... 3,91,827	4,94,397
Mahonda	... 56,700	86,404
Mtoni	... 5,09,466	5,62,966
Chukwani	... 2,19,124	2,84,291
	11,80,117	14,28,058

The average nuts gathered from bearing palms as opposed to mature palms, worked out at between 40 to 48 per pa'm for the year.

Twelve thousand two hundred and eighty-seven fraslas of copra (i.e. 192 tons) were made—between 95 and 100 nuts were required to make one frasla of copra.

At Selem and Mahonda about 200,000 nuts, and at Mtoni 30,000 nuts, were carried over to 1930, in the first instance owing to the lack of sufficient kilns, and in the second to a larger 4th picking than was expected.

The prices obtained throughout the year were for—

	Rs.	As.	P.	Rs.	As.	P.
Sun and smokeless kiln dried	...	4	4	6	—	3
Smoke dried	...	4	4	6	—	3

The deaths amongst bearing or mature stock compare favourably with 1928.

Cloves	...	467
Coconuts	...	253

During the year about 25,000 clove seedlings were distributed free to the public, and 17,000 coconut seedlings were sold.

The 40 acres at Kinaoni cleared for the purpose of trying out experimental crops were maintained in good order; detailed cost sheets for the years 1928 and 1929 have been prepared.

The work of surveying the various areas was continued during the year and the total acreage surveyed amounts to—

	Acres.
Zanzibar	... 14,254
Pemba	... 3,811

The figure for Pemba includes the 3,160 acres of the Ngezi Forest. A great deal of work remains to be done. There are still areas as yet untraversed, estimated at 250 acres in Zanzibar and 2,500 in Pemba, and so far proper detailed plans have been prepared for the Kizimbani Estate alone.

It yet remains to prepare such plans for the following:

Estate.	Acres.
Machui	... 3,408
Selem	... 4,117
Mtoni	... 1,532
Chukwani	... 1,585
Pemba	... 3,150

Labour conditions were fairly satisfactory as regards numbers if not as regards quality. This has been steadily deteriorating for years.

The Tractor working at Selem has proved its usefulness, doing good work at from Rs. 2 $\frac{1}{4}$ -3 $\frac{1}{2}$ per acre, according to the state of the ground and the quality of work desired.

GRAHAM TOMSON,

Manager of Plantations.

REPORT OF THE GOVERNMENT CHEMICAL LABORATORY

FOR THE YEAR 1929.

1. STAFF.

The Honourable the Director of Agriculture and Government Chemist and the Assistant Government Chemist were resident throughout the year. The Assistant Government Chemist acted as Assistant Director of Agriculture from August 17th.

2. EQUIPMENT.

The stock of apparatus and chemicals has been maintained and extended. The two most notable additions to the equipment were a vacuum oven and a Zeiss-Abbé refractometer. The latter will be of great assistance in the characterisation of essential oils.

The laboratory has been improved by the transference of the stores to another room and the fitting up of the old store-room as a balance-room, with reinforced concrete slabs to carry the instruments.

3. CHEMICAL WORK.

The number of samples dealt with was rather less than in 1928. During the first seven months of the year there were no examinations of cloves as the Agricultural Produce (Adulteration) Decree was in abeyance, and when the Agricultural Produce (Export) Decree, 1929, came into force in the middle of August exporters very quickly realised that it was useless to present wet or dirty cloves for export inspection, so that the Inspector required to submit comparatively few samples for analysis, the number of official samples being 51.

The total number of samples received was 387, compared with 423 in 1928.

These samples were received from Departments of the Government and other sources as shown in Table I.

TABLE I.

Department.	1st quarter.	2nd quarter.	3rd quarter.	4th quarter.	Total.
Agriculture ...	17	12	24	57	110
Health ...	39	37	50	36	162
Police ...	12	5	18	10	45
Customs ...	19	1	3	3	26
Other Departments ...	—	8	3	5	16
Total Government ...	87	63	98	111	359
Private samples ...	7	—	9	12	28
Total ...	94	63	107	123	387

There was a fair increase in the number of samples examined for private firms or individuals and several clove buyers availed themselves of the facilities offered for ensuring that their purchases were of "export quality". A total of Rs. 62-50 cts. was received by Government in fees.

The details of the Government samples are as follows:—

Agriculture.—Cloves, 57; clove leaves, 36; manures, 4; sim-sim, 6; odorous flowers, 2; soils, 2; other specimens, 3; total, 110.

Health.—Soda water, 55; cattle dip, 16; water, 1; distilled water, 2; ghee, 2; milk, public supplies, 18; milk, test samples from cows, 50; medicines, 5; tinned vegetables, 3; toxicological exhibits, 4; human milk, 1; other samples, 5; total, 162.

Police.—Spirits and other liquids for alcohol, 17; exhibits for bhang, opium, etc., 26; other samples, 2; total, 45.

Customs.—Spirits, perfumes, essences, etc., 23; medicines for opiates and dangerous drugs, 3; total, 26.

Other Departments.—Electricity and Wireless, 10; Public Works, 1; Port and Marine, 3; Administration, 2; total, 16.

NOTES.

(i) *Agriculture*.—Of the 51 official samples of cloves 3 were examined for foreign matter only; two contained 5 per cent or less and one was rejected (7.9 per cent). Of the 48 samples examined for moisture only, 20 were passed (16 per cent or less) and the remainder contained moisture above the limit as follows:—16.1—17 per cent, 19; 17.1—18 per cent, 5; 18.1—19 per cent, 2; 19.1—20 per cent, 1; over 20 per cent, 1 (21.1 per cent).

Six unofficial samples of cloves were examined for moisture; three contained less than 16 per cent, and the remainder 17.0, 17.6 and 20.4 per cent respectively. The foreign matter in two of the samples was estimated and found less than 5 per cent.

Nineteen samples of cloves were examined for merchants. In one the oil content was found to be 17.3 per cent. The moisture content of 18 samples was determined: nine contained 16 per cent or under, and of the remainder seven were below 17 per cent and the other two 17.4 and 18.0 per cent respectively.

Comparing the above figures with those given in previous years it will be seen that the quality of cloves submitted for analysis has greatly improved since the introduction of the Export Decree.

During the year, in co-operation with the Manager of Plantations, an experiment has been conducted on the leaf-fall from clove trees. Three one-acre plots were selected and the undergrowth cleared. The leaves falling from the trees thereon were swept up monthly, dried as far as weather permitted and weighed. Samples were brought to the laboratory, where they were air-dried to constant weight, and from the data the air-dry weights of the fallen leaves were calculated. A given quantity of each batch was then submitted to distillation and the oil yield determined. The results are shown in Table II, from which it will be seen that fallen leaves form a valuable raw material for oil production.

Three other samples of leaves were examined. One sample, roughly swept up during harvest time (mixed with twigs, etc.) gave 2.3 per cent of oil; the same leaves, hand-cleaned, gave 4.3 per cent; leaves picked from broken branches and dried yielded 5.25 per cent.

An experiment was made on the yield of copra from coconuts gathered at different stages of maturity, from which the serious loss involved in using unripe nuts was very evident. These experiments will be amplified later.

The drying of chillies was found to be facilitated by a preliminary scalding in boiling water, without impairing the quality of the product.

For a private firm some tests were made on agents for decolourising coconut oil. Two samples of imported decolourising carbon were found to be very effective, a perfectly white oil being obtained from a very yellow sample by the use of 1 to 2 per cent of the carbon followed by filtration. Next, but much lower, in effectiveness was locally made coconut-shell charcoal. Bleaching earth was comparatively useless.

(ii) *Health*.—The chemical analysis of milk was taken over from the Health Department Laboratory. During the early part of the year 18 samples from public vendors taken by Inspectors of the Health Department were examined. Twelve proved genuine—judged on the existing standard of three per cent fat and 8.5 per cent solids-not-fat—the average figures being: Total solids, 13.00 per cent, Fat, 4.16 per cent, Solids-not-fat, 8.84 per cent. Six samples were reported as adulterated; five contained added water 6.3, 11.1, 13.6, 14.6 and 31.0 per cent respectively; one sample was 20 per cent deficient in fat.

In order to arrive at a reasonable local standard by which to judge the purity of milks a series of test samples was taken at the milking sheds under the control of the Health Department. Of these samples 49 were analysed and a summary of results is given in Table III below.

TABLE III.

No. of samples.	Source.	Average composition, per cent.		
		Total solids.	Fat.	Solids-not-fat.
3	Native cows (morning)	14.67	5.53	9.14
11	Native cows (afternoon)	16.14	6.83	9.31
30	English cows (morning)	12.52	3.60	8.92
5	English cows (afternoon)	13.55	4.90	8.65
Average of 14 samples from Native cows		15.82	6.55	9.27
Average of 35 samples from English cows		12.67	3.79	8.88
Average of all 49 samples		13.57	4.58	8.99

The native cows were of Bombay, Barawa and Socotra breeds.

At the end of the year several exhibits were received in connection with the death of seven natives under suspicious circumstances. The examination of these was not completed in the period under review.

Three tins of vegetables were submitted for the determination of copper: these analyses were not begun until 1930.

Some assistance was given in connection with the new electrolytic installation for the preparation of sodium hypochlorite solutions.

Five imported medicines were found free from the drugs prohibited under the Dangerous Drugs Decree.

(iii) *Police*.—Alcohol was detected in all 17 suspected liquids submitted by the Police Department, and in most cases the percentage was estimated.

Of 16 exhibits for Opium 14 were proved to be that substance; one exhibit also contained Bhang. Six out of seven suspected specimens were found to consist of Bhang. Three other exhibits were proved free from Dangerous Drugs. Some fibres found in the nostrils of a native epileptic have not yet been identified.

(iv) *Customs*.—Determinations of alcohol in essences numbered 17; one perfume was alcoholic and two non-alcoholic; alcohol was determined in one liqueur; two food-colouring liquids were non-alcoholic. No Dangerous Drugs were found in three medicines analysed.

(v) *Other Departments*.—For the Electricity Department an investigation was undertaken into the water-softening treatment in use at the Power Station, and a special report was made. It was concluded that simple lime treatment would be effective, and the substitution of specially prepared imported lime for that burnt locally was recommended.

The Public Works Department sent in a sample of water from the new main laid to supply ships in the harbour, before it was put into commission; the quality was excellent.

Three samples of gold-leaf were submitted by the Port and Marine Department. They were obtained from merchants in the bazaar. Two were genuine; the third consisted almost entirely of copper.

The Administration Department sent two sets of brass measures of capacity for verification.

During the year 165 written reports were sent out, not including those given to the Inspector under the Agricultural Produce (Export) Decree.

4. MISCELLANEOUS WORK.

The Assistant Government Chemist was a member of the Committee appointed by Government to organize a Zanzibar Section for the Tanganyika Agricultural and Industrial Exhibition held at Dar-es-Salaam early in September, and went to the Exhibition in charge of the Section. A special report on this matter has been submitted to Government.

L. W. RAYMOND,
Assistant Government Chemist.

Zanzibar, 25th January, 1930.

APPENDIX.

TABLE I.

ASSISTANCE TO CLOVE GROWERS.

	1928.			1929.		
	Zanzibar.	Penba.	Total.	Zanzibar.	Penba.	Total.
(a) Loans for Harvesting.						
Number of Loans	...	2	63	...	1,198	1,424
Amount of Loans	...	1,300	13,761	...	97,132	1,71,431
(b) Free Storage of Cloves.						
Number of Advances	...	92	95	...	384	384
Amount of Advances	...	54,268	57,418	...	1,90,324	1,90,324
(c) Bonus Payments.						
On young trees	...	17,236	1,13,971	...	91,575.50	1,79,794
On bearing trees	...	1,78,994	4,84,478	...	...	...
(d) Produce sold through the C.G.A.						
	Cloves.	Stems.	Copra.	Cloves.	Stems.	Copra.
	Fras. lbs.	Fras. lbs.	Fras. lbs.	Fras. lbs.	Fras. lbs.	Fras. lbs.
Zanzibar Produce	7,680 18	712 06	188 08	16,099 05	1,118 16	...
Penba Produce	5,345 33	5 11	48 21	5,799 09	...	...
Totals	13,026 16	717 17	236 29	21,898 14	1,118 16	277 02

TABLE II.

ZANZIBAR AND PEMBA CLOVE GROWERS' ASSOCIATION.

RECEIPTS AND PAYMENTS ACCOUNT.

1st January to 31st December, 1929.

RECEIPTS.		Rs.	Cts.	Rs.	Cts.
To Cash Balance on 1st January, 1929 :—					
Office		610	20		
Bank		1,415	74		
		<hr/>			
To Loans from Government		2,025	94		
		2,17,000	00		
To Refunds of Advances :—					
Zanzibar members		22,382	44		
Pemba members refunded in Zanzibar		10,487	00		
Pemba members refunded in Pemba		58,200	20		
		<hr/>			
To Proceeds of Sales :—		91,019	64		
Zanzibar Cloves		86,983	26		
Pemba Cloves		86,477	68		
Pemba Copra		819	15		
		<hr/>			
		87,296	83		
		<hr/>			
		1,74,280	09		
				By Distribution to Members :—	
				Zanzibar Cloves	52,776 91
				Pemba Cloves	65,949 08
				Pemba Copra	749 19
				<hr/>	
				66,698 27	
				<hr/>	
				1,19,475 18	
				By Advances to Members :—	
				Zanzibar	74,299 00
				Pemba	2,87,456 00
				<hr/>	
				3,61,755 00	
				By Transport and Coolies :—	
				Zanzibar	1,481 38
				Pemba	260 00
				<hr/>	
				1,741 38	
				By Fuel and Materials :—	
				Zanzibar	2,860 44
				Pemba	2,213 52
				<hr/>	
				5,073 96	

To Interest on Loans :—					
Zanzibar members collected in Zanzibar	177	34			
Pemba members collected in Zanzibar	00	19			
Pemba members collected in Pemba	636	42			
			813	95	
To Sundry Receipts :—					
Handling charges Zanzibar	4,655	57			
Lorry charges Pemba	222	50			
			4,878	07	
To Pemba Cheques cashed at the Bank in 1930			8,772	68	
By Wages and Overtime :—					
Zanzibar				862	88
Pemba				701	00
					1,563 88
By Freight Pemba members account					2,325 95
By Brokerage on sales of Produce					180 21
By Interest paid to Bank					171 99
By Stamp duty :—					
Zanzibar				14	46
Pemba				54	00
					68 46
By Repayment to Government Lorry account					500 00
By Cash in hand on 31st December, 1929 :—					
Office				89	47
Bank				2,516	66
					2,606 13
Pemba Sub-Treasury (being amount paid in during last days of December, 1929, which did not reach the Bank in Zanzibar until 1930)				3,328	23
					5,934 36
Rs. 4,98,790 27					Rs. 4,98,790 37

TABLE III.

Clove deliveries compared with former seasons
(in frasslas of 35 lbs.)

		1924/25.			1925/26.		
Month.		Zanzibar.	Pemba.	Total.	Zanzibar.	Pemba.	Total.
July	...	341	2,721	3,062	5,596	15,445	21,041
August	...	2,235	26,409	28,644	9,366	40,711	50,077
September	...	23,358	88,072	111,430	42,162	88,069	130,231
October	...	43,968	90,716	134,684	67,918	80,357	148,275
November	...	43,274	74,445	117,719	38,215	44,699	82,914
December	...	54,090	51,365	105,455	27,531	48,615	76,146
January	...	43,641	49,239	92,880	10,759	5,852	16,611
February	...	11,264	41,348	52,612	5,814	20,267	26,081
March	...	9,439	32,107	41,546	2,322	16,617	18,939
April	...	2,933	23,259	26,192	1,291	13,647	14,938
May	...	4,304	19,222	23,526	2,186	10,639	12,825
June	...	2,105	21,587	23,692	6,032	7,704	13,736
Total	...	240,952	520,490	761,442	219,192	392,622	611,814

		1926/27.			1927/28.		
Month.		Zanzibar.	Pemba.	Total.	Zanzibar.	Pemba.	Total.
July	...	19,796	11,352	31,148	3,228	16,907	20,135
August	...	16,357	15,445	31,802	10,138	16,243	26,381
September	...	5,370	30,610	35,980	8,165	19,493	27,658
October	...	5,827	39,277	45,104	18,255	45,755	64,010
November	...	3,371	39,933	43,304	21,096	78,121	99,217
December	...	17,162	56,803	73,965	19,937	76,253	96,190
January	...	62,506	102,327	164,833	53,101	90,984	144,085
February	...	41,465	91,589	133,054	33,284	61,132	94,416
March	...	18,063	54,888	72,951	11,242	30,956	42,198
April	...	5,858	32,590	38,348	6,211	29,713	35,924
May	...	6,080	33,095	39,175	2,453	14,719	17,172
June	...	2,088	21,277	23,365	3,260	20,106	23,366
Total	...	203,843	529,186	733,029	190,370	500,382	690,752

		1928/29.			1929/30.		
Month.		Zanzibar.	Pemba.	Total.	Zanzibar.	Pemba.	Total.
July	...	8,576	13,336	21,912	3,677	3,818	7,495
August	...	4,084	21,224	25,308	14,993	43,900	58,893
September	...	3,512	20,276	23,788	23,026	97,040	120,066
October	...	2,984	20,544	23,528	36,962	101,478	138,440
November	..	1,268	11,808	13,076	46,000	83,513	129,513
December	...	7,152	12,276	19,428	35,173	68,428	103,601
January	...	22,764	11,708	34,472	51,713	50,560	102,273
February	...	7,560	5,248	12,808	26,996	36,965	63,961
March	...	4,996	2,436	7,432	18,004	27,058	45,062
April	...	11,444	1,776	13,220	12,860	43,863	56,723
May	...	200	3,828	4,028	6,249	24,060	30,309
June	...	288	1,280	1,568	4,643	16,943	21,586
Total	...	74,828	125,740	200,568	*280,296	*597,626	877,922

* These figures do not include 12,670 frasslas from Pemba and 38,351 frasslas from Zanzibar which were delivered to the Clove Growers' Association and which bring the total for the season to 920,943 frasslas.

TABLE IV.

Protectorate clove crops for the past 34 seasons:—

Season.	Zanzibar.	Pemba.	Total.
	Fras.	Fras.	Fras.
1896/97	86,000	224,000	310,000
1897/98	48,000	157,000	205,000
1898/99	145,000	466,000	611,000
1899/1900	64,000	221,000	285,000
1900/01	37,000	200,000	237,000
1901/02	44,000	323,000	367,000
1902/03	172,000	252,000	424,000
1903/04	27,000	99,000	126,000
1904/05	81,000	654,000	735,000
1905/06	178,435	129,735	308,170
1906/07	63,004	203,496	266,500
1907/08	213,662	541,993	755,655
1908/09	165,727	449,691	615,418
1909/10	109,678	300,047	409,725
1910/11	52,100	139,307	191,407
1911/12	216,507	582,153	798,660
1912/13	31,018	104,368	135,386
1913/14	145,586	638,094	783,680
1914/15	194,920	331,389	526,309
1915/16	141,641	655,116	796,757
1916/17	208,716	302,919	511,635
1917/18	63,958	234,239	298,197
1918/19	259,273	565,229	824,502
1919/20	93,847	168,703	262,550
1920/21	231,831	316,446	548,277
1921/22	65,819	200,983	266,802
1922/23	291,417	690,498	981,915
1923/24	75,027	236,767	311,794
1924/25	240,952	520,490	761,442
1925/26	219,192	392,622	611,814
1926/27	203,843	529,186	733,029
1927/28	190,370	500,382	690,752
1928/29	74,828	125,740	200,568
1929/30	*280,296	*597,626	877,922
Average 34 seasons	138,695	354,212	493,202

* These figures do not include 12,670 frassas from Pemba and 38,351 frassas from Zanzibar which were delivered to the Clove Growers' Association and which bring the total for the season to 928,943 frassas.

TABLE V.
Annual Clove Exports, Pemba.

Year.	WETI DISTRICT.					CHAKE-CHAKE DISTRICT.				M KOANI DISTRICT.					Total PEMBA.	
	Weti.	Mtambwe.	Junguni.	Kipangani. (Matanganyani)	Msuka.	District Total.	Chake.		Kiswani.	District Total.	Jamban- gome.	Mkoani.		Kengeja.		District Total.
							Fs.	Fs.				Fs.	Fs.			
1914	89,433	13,786	5,721	8,666	6,594	1,23,200	85,779	23,550				Fs.	Fs.		Fs.	
1915	1,64,655	25,072	12,992	21,738	11,126	2,35,583	1,46,913	46,330				13,988	16,947	21,826	91,804	
1916	1,17,387	26,709	12,168	7,305	5,950	1,69,519	84,507	28,707				26,732	40,228	46,692	1,92,722	
1917	20,951	12,135	5,248	7,828	4,449	50,611	23,096	8,011				14,788	22,144	42,279	1,42,142	
1918	76,309	17,786	15,555	10,503	5,429	1,25,552	1,25,634	16,032				4,654	12,010	10,850	50,628	
1919	1,40,562	18,810	10,269	7,427	5,763	1,82,831	77,261	28,463				28,153	10,583	37,815	1,32,346	
1920	31,674	3,304	1,010	1,001	4,874	41,863	30,311	5,499				16,964	13,876	26,807	3,97,572	
1921	1,04,539	12,302	10,650	7,714	9,663	1,44,668	93,601	20,740				2,096	6,923	11,823	1,14,948	
1922	1,18,000	17,700	3,400	7,500	6,700	1,51,300	1,07,070	37,500				55,703	26,131	44,756	3,98,083	
1923	1,33,688	20,244	18,814	12,308	4,897	1,98,951	1,19,289	34,196				16,200	51,100	45,400	4,87,000	
1924	88,472	26,387	7,109	7,225	4,946	1,34,139	97,033	35,516				15,490	27,149	49,595	4,97,749	
1925	72,322	31,115	6,870	12,520	7,403	1,30,250	1,25,808	61,752				30,153	38,506	37,254	1,62,453	
1926	57,588	24,492	3,773	3,408	1,879	91,140	71,571	28,914				18,842	38,196	56,448	4,95,515	
1927	2,26,479	28,973	13,967	30,322	16,491	3,16,242	1,07,563	41,450				10,629	16,159	37,432	9,920	
1928	62,454	27,955	4,888	7,602	3,780	1,06,739	77,746	21,967				38,937	24,923	35,140	1,77,319	
1929	1,03,434	23,065	11,327	5,786	2,776	1,46,389	1,46,036	20,531				36,086	9,563	42,041	1,41,173	
												35,183	13,417	56,836	1,51,570	
Average 16 years.	1,00,423	21,179	8,985	9,928	6,420	1,46,937	94,365	29,722				22,787	22,637	37,577	1,31,884	
															4,06,510	

TABLE VI.

Average prices of cloves during 1929/30, month by month, in rupees, compared with the five previous seasons:

Month.	1924/25.			1925/26.		
	Zanzibar.	Pemba.	Stems.	Zanzibar.	Pemba.	Stems.
July	24.83	22.58	6.31	18.34	17.72	5.17
August	21.28	18.97	4.40	18.46	17.80	4.64
September	18.83	17.07	4.30	17.35	16.61	4.36
October	20.79	18.91	5.55	17.05	16.73	4.21
November	21.22	20.07	5.62	15.12	16.11	3.85
December	19.75	19.41	5.30	16.35	17.65	4.38
January	18.00	18.16	4.81	16.72	17.61	4.24
February	17.66	17.42	4.34	16.61	17.17	3.99
March	17.28	17.62	4.62	16.98	16.45	3.91
April	16.03	16.12	4.24	16.37	15.97	4.22
May	15.37	16.14	4.34	16.31	16.16	4.19
June	16.22	16.57	4.70	16.32	16.34	3.08
Mean price	18.94	18.25	4.88	16.83	16.86	4.19

Month.	1926/27.			1927/28.		
	Zanzibar.	Pemba.	Stems.	Zanzibar.	Pemba.	Stems.
July	14.36	14.09	3.72	12.31	12.35	2.89
August	14.15	14.02	3.48	12.58	12.48	2.79
September	14.27	14.29	3.63	12.55	12.55	2.72
October	14.92	15.03	3.62	11.67	11.67	2.76
November	14.60	14.54	3.96	11.38	11.25	2.61
December	14.36	14.35	3.22	11.40	11.13	2.30
January	12.59	12.60	2.91	11.99	11.79	3.90
February	12.34	12.55	2.98	12.34	12.14	4.00
March	13.32	13.46	2.99	12.77	12.56	3.69
April	13.45	13.11	3.01	12.91	12.44	3.10
May	13.39	13.26	3.03	14.72	14.20	3.75
June	13.47	13.26	2.83	17.55	17.08	4.00
Mean price	13.77	13.71	3.28	12.85	12.64	3.21

Month.	1928/29.			1929/30.		
	Zanzibar.	Pemba.	Stems.	Zanzibar.	Pemba.	Stems.
July	22.49	23.61	4.49	23.37	22.37	4.26
August	21.10	21.25	4.59	19.30	16.32	4.03
September	22.08	21.93	4.63	16.50	15.50	5.16
October	25.04	24.89	6.11	17.81	16.87	3.89
November	28.92	28.29	6.15	16.26	15.46	3.85
December	27.61	27.76	6.02	15.56	14.94	3.60
January	30.98	30.64	6.65	14.74	14.20	3.17
February	30.47	30.85	6.89	15.50	15.12	3.18
March	33.91	33.04	6.75	18.72	18.65	3.81
April	31.14	30.19	6.95	21.91	21.83	4.95
May	32.08	31.65	5.49	20.96	20.68	4.44
June	31.95	31.68	5.37	20.01	19.84	3.85
Mean price	28.15	27.98	5.84	18.39	17.85	4.02

All the above prices are "duty paid".

TABLE VII.

Export of Copra (Produced in the Protectorate) for the past 24 years and average price per frasila of 35 lbs.

Year.	Fraslas.	Average for 6 years.	Average Price Rs. Cts.	Average 6 years. Rs. Cts.
1906	4,93,688		3 24	
1907	3,79,526		3 76	
1908	5,26,269		2 70	
1909	3,84,260		3 26	
1910	4,82,834		4 14	
1911	5,19,081		4 00	
		4,64,276		3 52
1912	4,76,366		4 19	
1913	4,74,368		4 85	
1914	5,38,112		3 87	
1915	5,49,472		3 73	
1916	3,50,238		4 72	
1917	4,21,316		7 10	
		4,68,312		4 75
1918	2,03,616		3 71	
*1919	9,07,329		5 31	
1920	5,33,595		6 59	
1921	4,99,907		6 60	
1922	4,69,878		5 33	
1923	6,01,110		4 82	
		5,36,739		5 38
1924	6,54,454		4 85	
1925	7,98,803		4 49	
1926	8,18,570		4 34	
1927	6,43,350		4 19	
1928	5,98,966		4 27	
1929	7,44,246		3 19	
		7,09,731		4 22

*Large holdover from previous year due to shortage of shipping.

TABLE VIII.

Monthly Average Price of Copra.

	1928.			1929.		
	Rs.		£	Rs.		£
	per frasila.		per ton.	per frasila.		per ton.
	Rs. Cts.		£ s. d.	Rs. Cts.		£ s. d.
January	... 4 37		20 19 5	4 12		19 15 7
February	... 4 32		20 14 8	3 75		18 0 1
March	... 4 33		20 15 7	3 75		18 0 1
April	... 4 36		20 18 5	3 75		18 0 1
May	... 4 35		20 17 6	3 57		13 0 1
June	... 4 38		21 0 4	2 50		12 0 1
July	... 4 30		20 12 9	2 50		12 0 1
August	... 4 25		20 8 0	2 62		12 1 6
September	... 4 14		19 17 4	2 62		12 1 6
October	... 4 11		19 14 7	3 00		14 8 1
November	... 4 15		19 18 4	2 88		13 16 0
December	... 4 19		20 2 3	3 00		14 8 1
Yearly Average	... 4 27		20 9 11	3 19		15 11 10

TABLE IX.

DEPARTMENT OF AGRICULTURE.
Revenue and Expenditure, 1929.

Revenue.

	Rs.	Cts.
Cloves	2,52,108	01
Coconuts	1,50,937	61
Miscellaneous	1,882	29
Rent of Leased Plantations	2,700	00
Ground Rents	822	75
Sundries	400	00
Plantations		
Others	1,181	27
Total Rs.	4,10,031	93

Expenditure.

SUB-HEAD	A.		B.		C.		D.	
	Administration.		Chemical.		Plantations.		Gardens.	
	Rs.	Cts.	Rs.	Cts.	Rs.	Cts.	Rs.	Cts.
Personal Emoluments	1,09,646	88	11,947	55	43,294	01	3,886	66
Labour for clove picking and drying	—	—	—	—	5,322	47	—	—
Labour for coconut gathering	—	—	—	—	7,903	74	—	—
Labour for cultivation of plantations	—	—	—	—	1,07,593	61	—	—
Labour for copra factories	—	—	—	—	10,064	81	—	—
Labour for Gardens and Open Spaces	—	—	—	—	—	—	11,260	86
Uniforms	526	69	—	—	48	16	—	—
Incidental Expenses	822	86	39	76	36	18	—	—
Passages	4,476	06	177	00	839	79	295	25
Materials and Tools	1,413	07	—	—	4,140	19	940	83
Travelling Allowances	3,203	47	—	—	337	55	—	—
Transport Allowances	1,920	55	—	—	993	19	—	—
Travelling and Transport Allowances	—	—	16	00	—	—	—	—
Transport Expenses	2,120	78	97	01	5,942	83	18	18
Light and Power	305	86	—	—	—	—	169	31
Fuel and Oil for Motor Vehicles	888	62	—	—	159	53	—	—
Repairs of Motor Vehicles and Bicycles	499	68	—	—	—	—	—	—
Repairs of Motor Vehicles	—	—	—	—	359	04	—	—
Chemical Apparatus and Books	—	—	687	85	—	—	—	—
Repairs of Plantation Houses	—	—	—	—	3,647	28	—	—
Purchase of Seeds	—	—	—	—	658	27	255	39
Copra Factories Erection and Repairs	—	—	—	—	1,246	17	—	—
Surveys of Government Plantations	—	—	—	—	4,787	17	—	—
Total Rs.	1,25,824	52	12,965	17	1,97,373	99	16,826	48

Special Expenditure.

Bonus for Planting young trees	1,79,794	00	—	—	—	—	—	—
2 Typewriters	645	22	—	—	—	—	—	—
Vacuum Oven	—	—	230	33	—	—	—	—
Centrifuge	—	—	344	34	—	—	—	—
Alteration to Laboratory	—	—	436	13	—	—	—	—
2 Platform Weighers	—	—	—	—	1,887	95	—	—
2 Disc Harrows	—	—	—	—	214	43	—	—
2 Lawn Mowers	—	—	—	—	—	—	220	92
10 Plantation Houses	—	—	—	—	3,644	40	—	—
1 Motor Car	—	—	—	—	1,973	62	—	—
Total Rs.	1,80,439	22	1,010	80	7,720	40	220	92

TABLE X.
EXPERIMENTAL WORK.
Statement of Details of Cost and Progress, 1928.

	Rs.	Cts.	PROGRESS.
ZANZIBAR.			
KINAONI.			
<i>Clearing.</i> —Cutting, burning and uprooting secondary bush. Felling and uprooting 14 mangoes and 140 coconut palms, on 40 acres	10,608	32	Maintained.
<i>Roads.</i> —Main road through area	45	00	Maintained.
<i>Surveys.</i> —Demarcating blocks	169	89	Maintained.
<i>Well.</i> —Sinking well near nursery	1,716	04	
	1,042	87	
<i>Watering.</i> —Wages of watering gangs	362	90	Dead.
<i>Cacao.</i> —Lining, holing, planting, upkeep	2,352	44	All alive.
<i>Bananas.</i> —Lining, holing, planting, upkeep	40		137 dead.
<i>Oranges Local.</i> —Lining, holing, planting, upkeep	300	61	Balance alive to date.
<i>Oranges South Africa.</i> —Lining, holing, planting, upkeep	176		Balance doing well.
<i>Taraktogenus.</i> —Lining, holing, planting, upkeep	837	48	All alive and doing well.
<i>Hydnocarpus.</i> —Lining, holing, planting, upkeep	104	61	28 dead. Balance making slow growth.
<i>Nutmegs.</i> —Lining, holing, planting, upkeep			Cut out.
<i>Pigeon Pea.</i> —Planted as shade	265	63	Doing well.
<i>Gliricidia.</i> —Planted as shade	738		Did fairly well.
<i>Pineapples.</i> —Lining, holing, planting, upkeep	5	00	Failure owing to leaf curl.
<i>Tobacco.</i> —Lining, holing, planting, upkeep	448		Died and replanted.
<i>Cinnamon.</i> —Lining, holing, planting, upkeep	3,729	49	105 dead. Balance showing fair growth on lower end.
<i>Coffee Robusta.</i> —Lining, holing, planting, upkeep			
<i>Nursery.</i> —Citrus stock and tobacco	668	75	
<i>Nursery.</i> —At Kitumba for coffee	393	84	
<i>Nursery.</i> —At Dunga for cacao	339	89	
<i>Sundry Porters</i>	5	00	
	18,053	38	
CHUMBUKI.			
<i>Cacao.</i> —Lining, holing, planting, upkeep	200		Dead.
<i>Bananas.</i> —Lining, holing, planting, upkeep	200		Failed.
<i>Alfalfa.</i> —Planting and upkeep $\frac{1}{2}$ acre	307	57	
	98	11	
	405	68	

MAHONDA.

Cacao.—Lining, holing, planting, upkeep
Bananas.—Lining, holing, planting, upkeep
Clove Leaves.—Cleaning one acre for measuring leaf fall

160
160

Dead.

256 26

DUNGA.

Cacao.—Ring weeding old cacao
Oranges.—Clearing two acres old saman trees
 Holing, lining, planting, upkeep

60 S.A.

Good growth.

604 33

MARAHUBI.—Pruning and thinning old citrus
 Experimental manure pit
 Planting mango seeds

Continued.

55 66

SELEM.—Nursery citrus stocks

Expenses connected with measurement of leaf fall and collection of
 clove leaves

Continued.

178 13

KIZIMBANU.—Felling clove trees and collecting leaves

Continued.

33 12

DOLE.—Experimental plot hill rice

Failed.

61 49

Total Zanzibar

19,648 05

PEMBA.

TUNDAUA.—Coffee nursery
 WESHA.—Coffee nursery
 MAKONDENI.—Lining, holing, planting, upkeep.
 Taraktogenus and cacao plot

28 11

21 88

871 94

921 93

20,569 98

TABLE X—(Continued).

EXPERIMENTAL WORK.

Statement of Details of Cost and Progress, 1929.

ZANZIBAR.		Rs.	Cts.	Rs.	Cts.	REMARKS.
KINAONI.						
Clearing.—Cutting, burning, uprooting secondary bush on 12 acres		1,862	50			Only small area used for bananas, cacao and pineapples.
Roads.—Upkeep and extension		220	00			Maintained and improved.
Well } Finishing work begun in 1928		69	37			
Watering } Wages of watering gangs		1,928	91			
Cacao.—Lining, holing, planting and upkeep of 1928 plantings	1,278	594	56			About 300 plants left for 1928 and 1929 plantings; 2,278 in all.
Bananas.—Lining, holing, planting and upkeep of 1928 plantings	1,730	460	64			Doing well or ill according to the location.
Oranges.—Upkeep of 1928 plantings		155	02			163 S.A. citrus alive. 36 local alive.
Taraktogetus. } Upkeep 1928 planting		256	89			Doing well.
Hydnocarpus } Upkeep 1928 plantings		40	00			Making slow growth; 76 out of 104 left.
Numeys.—Upkeep 1928 plantings		89	37			Pigeon pea eradicated.
Pigeon Pea. } Cutting for mulch, thinning and eradicating						Gliricidia growing well and being thinned.
Gliricidia. }						
Pineapples.—Lining and planting	2,366	71	24			
Upkeep 1928 plantings		30	00			All alive and well.
Tung Oil Trees.—Lining, holing, planting and upkeep	54	203	74			Failure owing to leaf curl.
Tobacco.—Upkeep, harvest and curing at Koani	5 varieties	90	02			Replanting showing fair growth.
Cinnamon.—Replanting 1928 plantings	448					Doing fairly but uneven.
Coffee.—Upkeep 1928 plantings		1,050	70			
Weeding, gapping and shading	3,624	157	49			
Groundnuts.—Planting, upkeep and harvesting		133	14			
Chilies.—Planting, upkeep and harvesting		78	12			
Liming.—Applying lime to all areas	3 tons	338	12			
Nursery.—Coffee and citrus stock	23 beds	172	82			
Superaision.—Extra headman		93	14			
Sundry Porters				8,035	79	

CHUMBUNI.					
<i>Cacao</i> .—Upkeep 1928 plantings	261 88	261 88	Eradicated as growth very poor.		
MAHONDA.					
<i>Cacao</i> .—Upkeep 1928 plantings	134 14				
<i>Clove leaf</i> .—Collection	98 10	236 24			
DUNGA.					
<i>Oranges</i> .—Upkeep 1928 plantings	13 75	13 75			
MARAHUBI.					
<i>Citrus</i> .—Pruning limes. Upkeep of old orange trees pruned and thinned in 1928	53 12		Maintained.		
<i>Mangos</i> .—Planting and upkeep of mango seeds	198 75	251 87			
SELEM.—Clove leaf experiments	641 08	641 08			
KIROPE.—Planting and upkeep of sim sim, maize, coffee, chillies and vanilla on the old firebelt	261 75	261 75	General failure.		
CHUINI.—(1) Eradicating lalang grass. Holing and fencing of 3½ acre plots at Chuini and Kama.	320 00		General failure.		
(2) Clearing and upkeep and planting of two ½ acre plots with cassia siamea at Bonani	71 89		Growth very poor.		
(3) Eradicating bush and lalang on 1½ acres at Nyanjale and planting with coffee and upkeep	360 00		Growth poor.		
MGONGO'WIA.—Holing and planting two acres coffee	85 63	751 89	Growth poor.		
		85 63			
		10,539 88			
	Zanzibar Total				

TABLE X—(Continued).

	Rs.	Cfs.	Rs.	Cfs.	REMARKS.
PEMBA.					
MAKONDENI.					
<i>Cacao</i> .—Upkeep, etc., 1928 planting	1,000	00			Abandoned.
Lining, holing, planting and upkeep 1929	300	00			
<i>Taraktogenus</i> . } Upkeep	345	00			Fair growth.
<i>Hydnocarpus</i> }					
<i>Chillies</i> .—Planting and upkeep	53	00			
Upkeep and trimming of clove hedges	50	00	1,748	00	
WETI.					
<i>Citrus</i> .—Planting and upkeep of citrus plot	200	00			
Avenue planting in Town areas	188	83	388	83	
WESHA.—Upkeep of coffee and taraktogenus	650	00	650	00	
Pemba Total			2,786	83	
PUBLIC NURSERIES.					
ZANZIBAR	1,500	00			
PEMBA	1,112	23	2,612	22	

TABLE XI.

Comparison of actual revenue and expenditure on the Government plantations year by year:—

YEAR.	REVENUE.				EXPENDITURE.				
	Cloves.	Coconuts.	Sundry.	Total.	Personal emoluments.	Cultivation.	Clove harvest.	Sundry.	Total.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1910	35,636	33,009	36,289	1,04,934	10,932	41,839	6,081	8,736	67,588
1911	1,01,313	41,576	33,004	1,76,493	9,362	54,780	28,366	10,127	1,02,635
1912	1,63,042	60,443	30,988	2,54,473	14,684	61,238	29,160	15,809	1,21,891
1913	1,85,185	72,771	29,053	2,87,009	17,962	62,554	38,391	15,643	1,34,550
1914	67,000	72,745	29,815	1,75,563	32,153	59,603	36,309	12,577	1,40,648
1915	1,77,977	74,964	25,800	2,78,741	41,660	65,522	55,439	5,785	1,68,406
1916	1,66,391	74,777	21,039	2,62,200	44,220	70,485	63,146	6,878	1,84,729
1917	2,50,348	1,01,511	16,321	3,68,180	41,492	79,149	23,535	1,51,120	1,51,120
1918	2,13,030	1,19,606	18,263	3,50,899	51,643	90,787	63,404	12,414	2,18,048
1919	2,08,491	1,27,650	15,708	3,51,849	55,879	1,15,741	37,446	11,229	2,20,275
1920	95,524	1,57,081	9,900	2,62,509	51,717	1,24,607	35,373	15,080	2,26,787
1921	3,61,736	1,47,999	18,456	5,28,191	65,410	1,44,979	93,434	21,981	3,30,897
1922	1,19,925	1,17,495	39,211	2,76,631	75,021	1,54,189	91,386	21,822	3,43,418
1923	4,28,266	1,82,159	13,642	6,24,067	71,539	1,60,919	64,520	27,280	3,24,358
1924	1,82,901	1,39,733	11,508	3,34,142	74,920	1,35,048	74,310	25,814	3,10,062
1925	4,10,240	1,75,784	9,209	5,95,233	58,700	1,33,511	67,334	34,606	3,14,151
1926	98,933	2,08,789	6,981	3,14,640	51,264	1,46,601	10,381	34,986	2,43,232
1927	2,03,258	1,99,228	4,524	4,07,010	44,851	1,17,573	46,484	46,257	2,55,166
1928	1,32,608	1,82,302	5,745	3,20,655	45,090	1,09,412	16,452	50,041	2,21,011
1929	2,52,108	1,50,938	5,804	4,08,850	43,204	1,17,594	5,324	48,884	2,05,094

TABLE XII.
Meteorological Observations, 1929.

Month.	Temperature.						Rainfall.										Sunshine.	
	Zanzibar Town.				Banani, emba.		Zanzibar.				Pemba.				Zanzibar Town			
	Means of		Absolute	Means of		Absolute	Town.	Salem.	Kidichi.	Koani.	Mko-kotoni.	Chwaka.	Weti.	Banani.	Mkoani.	Pituni.	Hours.	Average.
	Max.	Min.	Max.	Min.														
January	87.3	80.6	89.2	78.0	88.1	79.9	0.05	2.07	1.50	1.84	0.34	0.05	2.30	4.17	1.52	5.69	300.6	9.07
February	88.5	81.5	91.0	80.5	89.5	80.0	0.63	1.11	1.40	0.64	2.09	0.31	0.24	1.41	0.38	1.60	293.9	10.50
March	87.8	80.3	91.3	75.5	89.1	80.2	8.31	4.80	4.24	5.64	5.78	3.34	7.47	10.25	10.84	8.18	245.4	7.92
April	84.7	77.5	90.0	73.6	89.8	78.1	11.47	12.58	13.55	16.24	9.32	17.09	19.75	22.28	22.67	20.40	200.3	6.68
May	84.0	76.5	87.4	71.0	86.4	77.5	4.40	4.64	4.52	5.21	6.21	7.89	4.71	4.24	4.52	3.37	254.8	8.22
June	81.3	76.4	83.5	71.0	83.7	74.9	6.91	3.87	5.72	5.76	3.72	1.74	10.74	9.68	13.76	12.24	224.3	7.48
July	80.4	74.6	82.8	72.0	83.5	74.5	2.86	2.84	2.52	4.09	6.74	4.45	3.34	2.49	2.48	1.87	222.8	7.19
August	81.5	73.0	84.6	71.0	83.4	73.8	0.65	0.71	2.07	0.49	1.13	1.54	0.55	0.22	0.27	0.04	270.8	8.74
September	84.0	74.1	86.4	70.4	84.8	75.0	0.72	2.41	0.17	0.50	0.59	1.25	1.39	0.94	1.77	0.57	302.9	10.01
October	84.4	76.2	88.0	73.7	85.9	76.8	4.70	5.13	6.05	5.11	3.06	0.70	5.78	4.08	5.02	2.82	243.8	7.86
November	85.8	78.1	88.4	76.3	87.6	78.6	7.64	6.14	8.92	7.95	5.77	1.28	7.80	5.31	10.96	5.93	271.5	9.05
December	85.9	78.7	88.9	73.5	87.7	79.0	5.90	11.00	12.38	9.81	5.86	4.41	7.23	11.03	7.95	7.14	253.3	8.17
For the year	84.6	77.3	91.3	70.4	86.6	77.1	54.24	57.30	63.04	63.28	50.61	44.05	71.30	76.74	82.14	69.85	3084.4	8.04

Meteorological Observations.

January 1st to June 30th, 1930.

Month.	Temperature.						Rainfall.										Sunshine.			
	Zanzibar Town.			Banani, Pemba.													Zanzibar Town.			
	Means of		Absolute	Means of		Absolute	Pemba.													
	Max.	Min	Max.	Min.	Max.	Min.	Town.	Seleni	Kidichi.	Koani.	Mko-kotoni.	Chwaka.	Weti.	Banani.	Mkoani.	Futuni.	Hours.	Average.		
January	86.9	79.7	90.0	72.5	88.8	79.6	92.0	78.0	1.38	1.49	2.43	2.14	1.25	6.53	0.43	0.40	0.28	0.10	262.2	8.45
February	85.9	79.7	89.2	74.6	84.9	80.1	91.0	77.5	5.43	8.37	6.83	8.92	9.88	6.01	3.08	4.01	2.89	3.38	179.9	6.42
March	85.1	78.0	89.6	74.0	86.8	78.9	92.5	74.0	19.20	11.16	12.92	11.62	7.57	9.43	13.85	15.27	21.42	14.45	143.6	4.63
April	85.0	77.7	88.6	75.3	88.5	78.8	92.0	75.0	13.94	7.54	10.09	10.07	12.11	13.01	20.76	19.40	16.89	19.14	203.3	6.77
May	84.4	76.5	89.8	73.2	85.3	77.8	91.0	75.0	0.41	0.97	0.77	1.90	1.71	0.77	4.56	3.16	3.63	3.48	219.7	7.08
June	82.7	73.7	84.5	70.6	84.3	75.5	86.0	72.5	0.18	0.10	0.17	0.13	0.52	0.20	0.61	0.44	0.29	0.26	157.3	5.24
For six months	85.0	77.5	88.6	73.3	86.4	78.4	90.7	75.3	40.54	29.63	33.21	34.78	23.04	35.95	43.29	42.68	45.40	40.81	1166.0	6.04

